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The Oldest American Aeronautical Magazine



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CLEVELAND—AUG. 29 - SEPT. 7



New, complete and well-appointed Air Race Administration Building and Grand Stand, recently constructed by The Austin Company

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AVIATION

J. MURPHY BROS. PUBLICATIONS INC. CHICAGO

The Oldest American Aeronautical Magazine

EDWARD F. WARNER, Editor

Volume 11 • August, 1931 • Number 1



Fifteen years of AVIATION

FIFTEEN years is a very short time in most human affairs, but in aeronautical matters it is a long one. It is a long enough period to give his natural perspective. It is long enough to have covered two or three generations of airplane design, within each of which countless have passed from the status of greatly admired mechanical marvels to that of museum exhibits. It contains the whole history of commercial flying. It is fifteen years this month since the first issue of *Aviation* appeared.

They have been active and varied years. They have not been spent on the sidelines, delicately cheering the industry on, but down in the arena with it, sharing its trials and triumphs. *AVIATION* has been the industry's paper, for the discussion of its own affairs, and a vehicle for the circulation of propaganda or the persuasion of the outside world. There have been seasons of state repatriation when we have addressed ourselves directly to Congress or to public opinion, but they have been the exceptions. In general, like other business and industrial journals in other fields, we have had the function of speaking to the aeronautical community, not for it. To be of any use in such a role, a writer is indispensable. For fifteen years, *AVIATION* has observed, reported, suggested, advised, and when there was occasion has criticized. The course chosen has not always been the one that would lead to the greatest popularity, but the aggressive of the magazine's activities has, we hope and confidently believe, been of lasting service.

It has been a fascinating undertaking to read back over the volumes of the past fifteen years in preparing to write this retrospect. On innumerable succeeding pages we reproduce our records of a few of the great events of the period, but necessarily only a few. The earliest issues were full of names still very promi-

nent in the aeronautical field. Among the contributors of feature articles to the first volume were Goetz Loening, Donald W. Douglas, J. C. Henseler, now vice-president of Goodyear-Tippett, Ralph H. Upson, designer of the metal-clad engine, Capt. H. C. Richardson, now of Great Lakes, and Dr. C. Douglas Peab. Alexander Graham Bell was technical editor. The present editor of *AVIATION* was a general technical assistant, and a contributor to the first and all of the uneventfully succeeding issues.

The first two and a half years were predominantly military. With the end of the war chaos threatened the industry, and Lester D. Gardner, the founder of *AVIATION* and for eleven years its publisher, set to work to promote friendly relations between the industry and the public and between the industry and the government. His efforts culminated in 1926, a year before the Morrow Aircraft Board was appointed, in the drafting and presentation for discussion of a national air policy.

The light plane and glider movements were being fostered by *AVIATION*, through a special department, eight years before light planes finally suddenly came onto the American market in bulk. The glider events of 1922, the first year in which the soaring duration record exceeded an hour, were discussed and their significance interpreted by the present editor, and the first representative of American aviation to visit the Wiesnerberg, and by Edmund T. Allen, the first American pilot to participate in post-war European gliding.

Although commercial aviation and the commercial market have been of growing importance in the last few years, we have continued very much concerned with the work of the Army and Navy. The services and the industry have common interests of enormous importance to both. *AVIATION* has worked for a con-

August 1, 1932
\$640,000.000 Appropriated for Army Air Corps
The Army Air Corps has received from Congress a bill for \$640,000,000 for the fiscal year 1933. This bill is the largest appropriation ever made for the Army Air Corps. It includes \$100,000,000 for the purchase of aircraft, \$100,000,000 for the purchase of engines, \$100,000,000 for the purchase of fuel, \$100,000,000 for the purchase of maintenance, and \$100,000,000 for the purchase of personnel. The bill also includes \$100,000,000 for the purchase of land, \$100,000,000 for the purchase of buildings, and \$100,000,000 for the purchase of equipment. The bill is expected to be passed by Congress in the near future.

August 1, 1932
Aircraft Production in the United States
Reports of the Committee on the State of the Industry
The Committee on the State of the Industry has issued a report on the state of the aircraft industry in the United States. The report states that the industry is in a state of rapid expansion, and that the production of aircraft is increasing at a rapid rate. The report also states that the industry is facing a number of challenges, including a shortage of skilled labor and a lack of government support. The Committee recommends that the government should provide more support to the industry, and that the industry should continue to expand its production.

August 1, 1932
The Third Pulitzer Trophy Race
The Third Pulitzer Trophy Race was held on August 1, 1932. The race was won by Howard Hughes, who flew his Hughes Aircraft Company biplane. Hughes completed the race in 1 hour, 59 minutes, and 21 seconds. The race was held at the Curtiss-Wright Field in Dayton, Ohio. The race was a significant achievement for Hughes, and it helped to establish him as one of the leading aviators of the time.

September 15, 1932
Cliding Experiments in Europe - 1922
The Cliding Experiments in Europe were conducted in 1922. The experiments were designed to determine the effect of cliding on the performance of aircraft. The results of the experiments showed that cliding had a significant effect on the performance of aircraft, and that the effect was more pronounced at higher altitudes. The experiments were conducted by a number of leading aviators, including Howard Hughes and Charles Lindbergh.

September 15, 1932
San Francisco to New York in 33 Hrs. 20 Min.
The flight from San Francisco to New York was completed in 33 hours and 20 minutes. The flight was made by a Lockheed Vega, piloted by Harold G. Gatty. The flight was a significant achievement, as it was the first non-stop flight between the two cities. The flight was made possible by the use of a new type of engine, the Pratt & Whitney radial engine.

September 15, 1932
New Type of Flying Machine - The "Antelope"
The "Antelope" is a new type of flying machine. It is a biplane with a unique wing design. The "Antelope" is designed to be able to fly at high altitudes, and it is also designed to be able to fly at low altitudes. The "Antelope" is a significant achievement in the field of aviation, and it is expected to be used in a number of different applications.

September 15, 1932
The United States Wins the Schneider Cup Race
The United States won the Schneider Cup Race. The race was won by a Lockheed Vega, piloted by Howard Hughes. Hughes completed the race in 1 hour, 59 minutes, and 21 seconds. The race was held at the Curtiss-Wright Field in Dayton, Ohio. The race was a significant achievement for Hughes, and it helped to establish him as one of the leading aviators of the time.

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January 1, 1933
AERONAUTICS FOR 1917
The development of aeronautics in 1917 was a significant year. It was the year that the United States entered World War I, and it was the year that the United States began to develop its own military aviation. The year 1917 was a year of rapid progress in the field of aviation, and it was a year that helped to establish the United States as a leading power in the field of aviation.

January 1, 1933
Naval Transatlantic Flight Expedition
The Naval Transatlantic Flight Expedition was a significant achievement in the field of aviation. The expedition was led by a number of leading aviators, including Howard Hughes and Charles Lindbergh. The expedition was designed to determine the feasibility of a transatlantic flight, and it was a significant achievement in the field of aviation.

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The great flight

"HAPPY," observed some scribes, "is the nation that has no history." The same may be said of long-distance flights. They are successful in proportion as they are lacking in dramatic features, excitement, or suspense. By that standard, the performance of Messrs. Post and Gatty assumed the very highest measure of success. A little fog over the Atlantic, a little uncertainty about the location over England and Germany, a little land in eastern Siberia, a little propeller damage in Alaska, proved only trivial disturbances. It is a difficult subject for editorial treatment, for although the idea of circumnavigating the world in less than nine days, barely one-twelfth of the time that Jules Verne allowed his hero, is full of the elements of drama and romance, there was nothing dramatic about the accomplishment. It was the very perfection of adherence to plan. Post and Gatty made a schedule and they followed it. It was all as simple as this.

We call this the great flight. Not a, but, the great flight of the last three years. We couple it only with the brilliant triumph of expedition and effective training, the Italian expedition's expedition from Rome to Seoul during the past spring, and with Cortes's 5,000-mile struggle into the teeth of the howling wind last summer. The flight around the world was one of the few superlative achievements so far listed on the pages of aeronautical history, along with the exploits of Alcock, Lindbergh, and Kingsford-Smith. For Post and Gatty, planes in Valhalla are securely reserved. The flight also equal stature upon the annals and their reputations. It is an accomplishment that deserved world-wide appreciation, and it is disconcerting to have to report an apparent campaign of deliberate belittlement in a section of the European travel press.

Though it is hard to pick out a single feature where everything appears to go so smoothly, the organizers certainly call for special comment. Never before has there been such long command, quick, effective use of official maritime authority in the air. Few if any long flights over water and over desolate and unmarked country have been held so closely to a known and predetermined course. Harold Gatty joins Sir Arthur Whittam Browne, Laenz, Albert Hegenberger, Admiral Coutebois and a few others in the select company of the great pathfinders of the air.

We have been uniformly opposed to hops across the North Atlantic by land planes. Even in the event of success, nothing new is accomplished. Our own columns have been, and will remain, closed to any report of the doings of the pilots who embark upon these voyages. The Post-Gatty flight is a different category. It had a new and definite objective, it was planned in all possible detail, and the hazards of the Atlantic crossing were only a minor incident of the story.

However great our admiration for an exploit like this, we are slow to dwell upon its "commercial aspect." Such flights are a great test of the men and a

test of the machinery, and they bear evidence upon the qualities of both, but it is altogether too easy an assumption that they are simply the forerunners of regular commercial operation. It is four years since Lindbergh flew from New York to Paris, and since the newspapers were filled with prophecies of early regular commercial operations without stop across the north Atlantic. A realization of those glib promises still looks very far away. But in this case the flight serves another purpose. It calls attention to airlines that already exist over the greater part of the round-the-world route. The phrase "remote places of the earth" is fast becoming an anachronism, and states that our registered only glimmering spots on the map, occasionally reached by great explorers after terrible hardships, now correspond to airports where mail planes arrive and depart at daily or weekly intervals. Regular service shuttles to and fro from Moscow to Lhasa. Airlines tie the cities of the United States and eastern Canada directly to the Yukon territory and to the mouth of the McKenzie River, where ten years ago canoe and dog-sled offered the only choice in transportation. They run over Brazilian jungles and over the deserts of the West Coast of South America, and link the two together with a crossing of the high Cordillera. Post and Gatty remind us of the excellent quality of aviation gasoline on the flying fields at Novo-Sibirsk and Khabarovsk, and in central Alaska they found a store of spare parts and a quality of mechanical service worthy of a metropolitan airport.

If Post and Gatty had done nothing else, we should render homage to them for having brought us the most successful and dramatic of all possible means that air transport is sweeping away the last frontier, and bridging nations at the antipodes closer to each other than were neighboring villages three or four generations ago.

The patent racket

AMONG seamen after cheap publicity, sounding the shrill of "racket" now means second only to "sell" billing. At the risk of being accused of jangling this class, or of being "on the spot" by the Patent Lawyers' Protective Association, some comment seems necessary as a situation connected with the granting of patents which now results in material economic loss to a group of persons who can ill afford it.

No one wishes to discourage the development of new ideas, or to withhold the right of an inventor to protect his "brain children" from willful or unintentional adoption by others. There are misadmissions, however, of a growing tendency of certain patent lawyers, especially those who maintain great organizations and advertise copiously, to take advantage of the enthusiasm and lack of education of many of the people who rush to them with inventions. Their optimism is exaggerated

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by encouraging them to apply for patents on ideas that are basically sound, and which obviously will never yield the inventor anything but a full fat services rendered by the attorney.

In the aeronautical field alone over 100 patents have been granted in the course of the last three months. We have carefully studied, analyzed and classified them. The first assumption was to distinguish between those patents which were based on sound theory, engineering, or experience, and those which were obviously the product of imaginative totally unacquainted with even the most elementary knowledge of aerodynamics or mechanics. Some difficulty arose, however, in making a hard and fast discrimination between the two, and a third, intermediate class of "border line" cases was set up. This group contains ideas that may have some practical application in the future, although there is considerable doubt as to whether any appreciable percentage of these will ever reach the stage of practical use.

It is significant to note that the majority of patents classified as sound involved improvements in structure and details of existing designs, and arose, in most cases, out of the work of established manufacturing or research organizations. On the other hand, those classified as impractical contained an amazing number of break flying machines which carry one back to the days of Danton Gooss. Only 37 per cent of the total were obviously sensible,—17 per cent represented the border line group, and 46 per cent could be classed only as hopeless frolics. Of schemes submitted by individuals to government departments not one out of forty could ever be of any conceivable use.

Anyone who sees and takes to a few typical examples among the mass whose attention belong to the latter class will be more inclined to pity than to ridicule them. Sincerely convinced that they have actually stumbled on something of revolutionary importance, they depict themselves out of paper food to find the funds for developing the big idea. Frequently they assert confidently that the particular invention at hand is really incidental, important though it may be, and the big thing which they have accomplished is a perpetual-motion machine, which is actually perfected but for which they lack only the necessary funds for construction. What an opportunity for a conscienceless lawyer! A few shilled words of encouragement and another aerial invention is added to the already bursting files of the patent office, and the cash registers click merrily as the fees come in. Today, the average cost of obtaining a patent is about \$200. Taking into account only schemes obviously impractical, during the last three months alone it has cost high school students, postage mechanics, front window, and what not, over \$15,000 to protect aeronautical ideas which, in the aggregate, are scarcely worth the paper they are printed on.

It is quite obvious that the patent lawyer is not equal to the task of separating the sheep from the goats. Even if he were always as honorable and upright man, passing his client's interests ahead of his own (and un-

likely that it is not the case), he lacks the specialized technical knowledge to undertake that responsibility. The average inventor is the "freak" class, fixed from the fringes of his labor will be snatched from him, is wary of seeking advice, and is primarily concerned with protecting his idea at all costs. A great deal of money could be used to individuals and the patent office machinery could be cleared of much of the trash which now encumbers it if there were available to inventors some trustworthy group of technical advisers who would pass on the practical merits of ideas submitted to them. The national engineering societies today have all the necessary machinery set up to perform this function. They have access to highly trained men of unquestioned reputation in all fields of engineering, and very little in the way of additional organization would be required to establish such a service. If by some means they could keep even a part of the "freak" inventors out of the hands of the patent racketeer the effort would be worth while.

Three cheers for the kindergarten

INTENSIVE development of the light plane is one of the major features of the aircraft industry's record for 1931. Excellent light airplanes have been placed on the market, but we cannot agree with any sales strategy which seeks to force these planes directly into the hands of novices. Early spring estimates of the light plane market remained as only too forcibly of the estimates of prospective aircraft men that were customarily made and accepted in 1928 and early 1929. We do not believe that the time has come to attempt great quantities of light aircraft on the unprepared general public. Neither the planes nor the facilities for their proper maintenance and operation are ready for general public acceptance. Any fundamentally new type, no matter how perfectly and pliantly it has been designed and built, should have a full season of operation in the hands of qualified members of the aviation industry before it is ready for widespread introduction to beginners with no previous aeronautical interests.

There are sales outlets within the industry for a very handsome number of light aircraft. They are making it possible for schools to offer instruction at very low rates, and for service companies to offer planes to rent for solo work at prices far beneath those now in force. The wider development of cheap flying schools and of day-passant services which make it possible by intelligent use of the light plane to fly as much as to establish the service and repair facilities which amateur flying requires.

Proper application of the light plane by the industry itself will provide the answer with an aeronautical

Assistant Secretary (logistics), however, has offered his opinion that the Navy is so well attuned at present that a new procurement program is unnecessary. He said that a greater indication is that all naval assets equipped with their full complement of planes will be portable.

Navy in the market

Though a few days previously it had been assumed that the purchase of 138 planes would be postponed, partly because of an economy program, but also to await the results of further trials of improved piston, turboprop, and turbojet engines. The Navy Department opened bids on a group of patrol boats and aircraft engines in June. For the patrol boats, manufacturers offered alternative bids on two designs, the lower of the Glaco L. Marina bid—\$54,116.00—giving a unit price of about \$70,000 per plane without option, the lowest figure required. The second bid by Douglas Aircraft Corp. was \$112,780 for 23 planes, approximately \$50,000 each. The lowest bid offered for 49 engines and their parts was \$492,558 by the E. F. Elus Company. The simply expressed Bristol-Laporte design, at a unit cost of about \$7,700 without options. This is the first bid for a larger quantity of engines of the British Bristol design submitted to the service by the American licensee in competition with all-American manufacturers.

One of two bids by Wright Aircraft Company was next lowest, with \$522,500.00, a price of \$6,180 for each of its Cyclone engines. Pratt & Whitney offered \$579,998 or \$8,250 for each Horner engine. The award of a contract to Curtiss Aeroplane and Motor Company by the Department of the Navy for 36 Vought planes at \$443,235.75 has also been announced—about \$17,640 for each two-seater observation machine without option.

The Navy Department has awarded a contract for two autogiros to the Pitts Aircraft Company for \$144,000. They will be tested for observation as well as observation planes.

Autogiro achievements

Public attention has been attracted to the title which Miss Amelia Earhart has just made across the continent and back in an autogiro. She flew 11,000 miles at slightly more than 150 hours, the first autogiro being small but capable, which would have had no landing necessary. The planes flown by Miss Earhart are among the 25 autogiros licensed or developed by the Department of Commerce up to July 1.

The R.A.F. parents

At the annual Royal Air Force banquet at Hendon the winner recently

made its speed and maneuverability of British aircraft was strikingly displayed. The Hawker Fury, a single-engine fighter without par at the water of speed among the fastest of the world, equipped with a 500 hp. Rolls-Royce engine, cruises 214 m.p.h. at the high altitude for its superlatively especially for its excellent and service flying displayed the ease and precision with which these planes and their better models such as the Hawker Hurricane are to be handled. Machines designed for their use in design usually were the Vickers bomber with its four Rolls-Royce Kestrel engines and the Bristol Beaufighter designed and built as a conventional bomber, not so much as a laboratory machine.

New engines

Experimentation with heavy oil engines, which has been going on steadily in England for a long time, bears its first results. A "Beaufighter" Rolls-Royce engine has been developed, capable of 550-700 hp. and weighing 1,400 lb., giving a ratio of about 21.7 hp. per lb. as compared with 23.5 hp. per lb. in the Junkers and Packard engines. One of the Junkers biplanes, the engine June 4 made 242 hp. at 14,000 ft. in its fourth run at 242 hp. per lb. Fuel consumption during the trial was .37 lb. fuel and 0.11 lb. lubricating oil per horsepower-hour.

Another method of aircraft propulsion has been suggested by the late Sir Robert H. Goddard, of Worcester, Mass., who has been working with high-liquid fuels for more than ten years, now 70. His latest design, the gas June 4, made 242 hp. at 14,000 ft. in its fourth run at 242 hp. per lb. Fuel consumption during the trial was .37 lb. fuel and 0.11 lb. lubricating oil per horsepower-hour.

Aeronautical independence in sight in U.S.S.R.

Non-official report from the U.S.S.R. indicates that the Russian aviation there will soon prefer that to be independent of the foreign equipment which up to now have depended almost entirely on aircraft. Engines of 400 and 450 hp. have recently completed Russian designs, of which Kallin has the most important. Five of the more powerful of these engines are being used in a 32 passenger plane which, if successful in tests, will be produced in quantity to equip all airlines in the Soviet.

Corporation developments

A new corporation in the aeronautical world is the British Aviation Service Corporation, Ltd., formed in

London to take over and around the work of the British Aviation Service Group, organized in 1924. The capital of \$2,500,000 is 35 shares but has been subscribed and put in an amount which will allow numerous companies, which, through their agencies in every part of the world, will be able to offer aeronautical insurance in a wide range to meet a rapidly increasing demand.

Harold V. Threlkeld has been appointed acting chief engineer and general manager of Fokker Aircraft Company, Albert A. Gussner, former chief engineer, has resigned, together with a number of his associates. Mr. Threlkeld was formerly and briefly the general manager of the Pittsburgh Metal Aircraft Corporation, recently acquired by General Aviation, of which the Fokker company is also a subsidiary.

Close upon the heels of the announcement of his resignation as chief engineer of General Aviation came Anthony Fokker's plan for the extension of his own manufacturing interests in an Italian-owned Fokker Corporation being created in the middle of 1933. With the completion of provisions and new under construction, including agreements with General Aviation, the Fokker company, which has been more recently to Fokker, leaving him free to carry out his plan for the new company which will have its headquarters in this country.

The title of the New Standard Aircraft Corporation, pending for several months, has finally settled with the authorization by the American Government of incorporation for its merger with Panama Aircraft Corporation to form the new Standard Aircraft Corporation. The new venture will have 10,000 shares each of common and preferred stock, so the interest appears to be a great one. Standard Aircraft Corporation is now a public company, and its assets, administration expenses, wages, shares and mortgages held by the Standard company.

The treaty of the Maine Aviation Corporation is still a matter of conjecture. Negotiations relative to the possible acquisition of the company by St. Louis are still going on, but no agreement has been made.

Important legal decisions

The material substance of the law, together with intention to meet and help in the future, is to be seen in a new law which will give the aviation law more force. The new law is to be seen in a new law which will give the aviation law more force. The new law is to be seen in a new law which will give the aviation law more force.

Several judicial decisions have been made recently which influence legal aviation, still in the formative stage as contained with aeronautics. Where the law is in the formative stage as contained with aeronautics. Where the law is in the formative stage as contained with aeronautics.



OVER THE DOVER CLIFFS
Shown at the conclusion of his glide from the English side of the English Channel to the French side and back back.

passed, known to lawyers as the Boston Municipal Court as been for the time that the court of a Colonel. This court place could not have stopped shortly after leaving the airport except in a result of negligence on the part of the company, the court ruled the company responsible for a crash landing in the U. S. District Court of Wyoming, clearing the exemption of an insurance transport line from the state guarantee. Then the grounds that its operations within the state were only incidental, the ruling was that the acquisition of the tax was valid, since there was no discrimination made against the company in levying it, and the tax receipts were used to provide airport and airway facilities required by the transport operator.

A case upon which seemed to hang the establishment of a precedent in the legal responsibility of air transport companies, and the determination of their ability to escape compensation claims by their passengers, was set at the fall of a contract was brought against Transcontinental Air Transport by Mrs. J. S. Law in the U. S. District Court at Philadelphia. She claimed \$150,000 compensation for the death of her husband as a result of a T.A.T. plane crash at Indianapolis in December, 1929. However, the case was settled out of court for \$5,000 and the legal case remains material as before.

The Chamber organizes its legal activities

To present a common front for the aviation industry in dealing with its

legal and legislative problems, the Associated Chamber of Commerce has re-organized and strengthened its legal and legislative committee. The scope of the committee's work is extensive, covering both the broad fundamentals of air law and such questions of detail as possible legislation. It plans close cooperation with the American Association of Air Law and the Air Law Committee of the American Bar Association. The legislative policy is generally to be to urge as little legislation as possible.

The state legislatures

Legislators of a major national effort has been started by Florida and Michigan as regard to airports and landing fields. Florida has introduced the State Road Department to establish emergency landing fields along highways, and extended the power of individual counties to make their own airports, emergency land, though the expansion of the Road Department for the purpose are limited to \$20,000 in any one year. The Board of Aeronautics of Michigan is now authorized to require the marking of all obstructions within boundaries of all airports, and all airports are to be marked with red lights. The creation of new legislation, both in other forms or poles within 1,000 ft. of an airport is expressly forbidden by the new statutes, but in the case of obstructions already existing the marking is to be done at the expense of the airport operator. The only legal obligation placed on the owner of the obstructions are that he must permit free access to it for the purpose of marking, and he must make an objection to a change of the rules within 30 days.

Objections and New York have joined the ranks of states requiring license from the Department of Commerce for all airports and pilots operating within the state. The New York Legislature has also moved to prohibit the sale of gliders except with Department of Commerce permission, and to restrict parachute jumping for recreation and test purposes. Plans carrying passengers for hire in the state are required to adhere strictly to air traffic regulations, including the safety rules for the Department of Commerce more than a year ago that a transport plane must land immediately when a low ceiling forms it below 500 ft. altitude.

Efforts of the Department of Commerce to protect not only the safety of airplane pilots and passengers, but also the safety and comfort of the population over which they fly, are evident in action taken recently by the Aeronautics Branch. The Department of Commerce more than a year ago that a transport plane must land immediately when a low ceiling forms it below 500 ft. altitude.

Department of Commerce

announcements

Efforts of the Department of Commerce to protect not only the safety of airplane pilots and passengers, but also the safety and comfort of the population over which they fly, are evident in action taken recently by the Aeronautics Branch. The Department of Commerce more than a year ago that a transport plane must land immediately when a low ceiling forms it below 500 ft. altitude.

Twenty of the 36 Fokker planes withdrawn from scheduled passenger service by the Department of Commerce, returned to their owners, pronounced satisfactory and returned to service. The strategy was to be used for the purpose of the aircraft used where necessary, and the planes now carry the Department's requirements fully.

Personnel

Thomas A. Morgan, president of North American Aviation, Inc., has been elected president of the Curtiss-Wright Corporation. He was formerly president of the Curtiss-Wright Corporation, and will remain chief engineer of the Curtiss-Wright Corporation, Rochester, N. Y., has resigned from that company.

J. R. Johnson, chief of the Materials Branch at Wright Field, is to be a member of next year's Executive Committee of the American Society for Testing Materials. Spangler, Director J. H. Tullough, Superintendent of Airways of the Canadian Department of National Defense, has resigned to become chief of the Civil Aeronautics Branch, Columbia, Missouri, United States.



times the fatigue limit for completely reversed stress ($S-N$).

Residuals after properties

Forming methods. The chemical composition or method of manufacturing, that is, by open hearth or electric furnace, apparently has very little, if any effect on the fatigue limit except in a very rare case where the amount of segregation or foreign particles in the steel. The contents of several investigations are practically unanimous in this regard and are supported up by "Offset and Slack," the extensive properties are concordant with the results obtained and are not peculiar to the chemical composition.

The fatigue limit bears a rough close relationship to the tensile strength. Brinell hardness data in the proportional limit, yield point, elongation, reduction of area or impact strength. It may be shown or better the proportional limit. The ratio of fatigue limit to tensile strength varies from 0.40 to 0.90 and is also assumed to be 0.50. It is not constant, however, as it is affected by several variables which may not affect the tensile strength, such as variation in structure, presence of stress, either internal or external, and presence of residual stress in the material due to heat treatment or cold work.

The close relationship between tensile strength and fatigue limit is shown in Table I. Specimens were machined from the same bearing and check of the tensile strength was the fatigue limit. The low limit was parallel to the axis of the specimen. The check material is worked upon in fatigue and has higher tensile strength and fatigue limit.

The effect of variation in microstructure is shown in Fig. 5. The specimens were cut from the same block of one different type of annealed steel. The chemical composition in both cases conforms to S.A.E. 1030 steel. Specimens A and B were machined from a hot rolled coil which was heated to 1,800 deg. F., air-cooled and then reformed in three drafts to a half, wire. Specimen C was manufactured from a smaller rod which was air annealed, reduced in two drafts to 1/2 inch and then quenched in oil from 1,450 deg. F. and drawn in air at 1,300 deg. F.

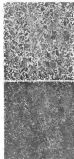


Fig. 5. Structure of aluminum wire, magnified 175 times. Structure is fine-grained, elongated, and fibrous. Some grain growth, fine-scale secondary structure and necks visible.

Non-forming methods. The fatigue limit of non-forming metals does not show the same relationship to tensile strength as in the case of forming metals. In general, annealed material does not have as high an endurance limit as stress relieved (cold worked) material of the same metal for the tests shown in Fig. 2 was taken at random from stock used for manufacturing fuel lines. The copper tubes were fine, annealed, drawn by 0.002 in wall thickness. The endurance limit was 18,000 psi. The physical properties were shown in Table 2. The specimens from which the curves (Fig. 2) were drawn were machined and polished on the inside and outside surfaces. Specimens were drawn in air with the original wall finish. The re-

sults are shown by the circles. The stress plus area variation in the original surface reduce the fatigue limit of the stress hardened tube approximately 20 per cent at 10,000,000 cycles. The endurance limit for the annealed tubing is 14 per cent.

The results on polished copper tubing agree favorably with results on polished specimens from cold bars obtained by other investigators, especially for the annealed material.

In the case of pure aluminum, the difference between annealed and stress-hardened material is less marked. Timmerman reports 2,000 lb. per sq. in. for the former and 3,000 lb. per sq. in. for the latter. Heat treatment of aluminum also affects the tensile strength and yield point to a much greater extent than for the fatigue limit. The tests on aluminum tubing shown in Fig. 2 were run on much heavier 200-300,000 cycles which may account for the comparatively higher value for the tubing over the bar stock.

Fatigue limits cannot be predicted from previous results on aluminum from the same base metal but with a different composition.

Cold work or heat treatment

The tensile strength, proportional limit and hardness of the metals used in aircraft construction are increased by annual cold working such as rolling, drawing and shearing. Structural carbon and alloy steel, aluminum and other non-ferrous metals are affected in the same way by quenching and tempering or aging. The fatigue properties are also affected by heat treatment. In fact, the ratio of fatigue limit to tensile strength remains practically constant provided the specimens are subjected to sufficient treatment. Maximum fatigue resistance is in the case of some other non-ferrous alloys practically nonexistent.

The methods used in cold working stress ahead or during the surface, such as rolling, drawing and shearing, which reduce the fatigue properties. The tests reported in Table 3 were made on machined and polished specimens. Specimens were drawn in air with the original wall finish. The re-

Design trends in approved type airplanes

By Clarence M. Young

Astorian Secretary of Commerce for Aeronautics



CLARENCE M. YOUNG

For almost four years the evaluation of American airplanes and engines has been under the supervision and general control of the Department of Commerce. Every design has been checked in detail and approved before it has gone into general production for commercial service. What has been the course of this evolution? How does today's or tomorrow's speed, or wing loading in 1931 compare with the figures for 1929 or 1927? There has been a deal of loose speculation on these topics, but relatively little citation of specific evidence. Now the Department has made an analysis to determine the facts. The results of their study stand in this article by Secretary Young, prepared especially for AVIATION, which it is our privilege to present.

continued on inside the starting point in development of another model.

If the report to airplanes, the greatest activity in designing new models appears to have been in 1929—at any rate the number of approved type certificates issued that year was greatest. The peak in issuance of approved type certificates was reached in the third quarter of 1929, when 15.2 per cent of all certificates for the three and four-quarter years issued. The last three months of 1930, on the other hand, provided only 5 per cent of the total number of certificates.

Power loading declines

However, despite the variation in number of certificates issued from year to year, the trends in various specific phases of designing were seen in more exact, in fact when definite control.

To take a specific example—power loading declined throughout the period. Average for power loading, and other data such as well, were computed on a quarterly basis over the three and four quarter years period. It was found that the trend in power loading had been downward in nearly every year. At the same time, wing loading increased. In other words, the average approved type certificate model for a given model had was being replaced with a power plant of greater horsepower, and therefore was being increased in empty weight, an increase weight due in part to the heavier engine and in part to the stronger structure necessary to accommodate it. However, this weight was not compensated for by an increase in wing area. On the contrary, the wing area remained about the

same. PLANE design in the past few years have been striving for greater speed, with the result that the average speed of modern airplanes is rapidly increasing. This is evident in the increase in the average landing speed of airplanes. The average landing speed of airplanes in 1929 was 100 m.p.h. in 1930 it was 110 m.p.h. in 1931 it was 120 m.p.h. in 1932 it was 130 m.p.h. in 1933 it was 140 m.p.h. in 1934 it was 150 m.p.h. in 1935 it was 160 m.p.h. in 1936 it was 170 m.p.h. in 1937 it was 180 m.p.h. in 1938 it was 190 m.p.h. in 1939 it was 200 m.p.h. in 1940 it was 210 m.p.h. in 1941 it was 220 m.p.h. in 1942 it was 230 m.p.h. in 1943 it was 240 m.p.h. in 1944 it was 250 m.p.h. in 1945 it was 260 m.p.h. in 1946 it was 270 m.p.h. in 1947 it was 280 m.p.h. in 1948 it was 290 m.p.h. in 1949 it was 300 m.p.h. in 1950 it was 310 m.p.h. in 1951 it was 320 m.p.h. in 1952 it was 330 m.p.h. in 1953 it was 340 m.p.h. in 1954 it was 350 m.p.h. in 1955 it was 360 m.p.h. in 1956 it was 370 m.p.h. in 1957 it was 380 m.p.h. in 1958 it was 390 m.p.h. in 1959 it was 400 m.p.h. in 1960 it was 410 m.p.h. in 1961 it was 420 m.p.h. in 1962 it was 430 m.p.h. in 1963 it was 440 m.p.h. in 1964 it was 450 m.p.h. in 1965 it was 460 m.p.h. in 1966 it was 470 m.p.h. in 1967 it was 480 m.p.h. in 1968 it was 490 m.p.h. in 1969 it was 500 m.p.h. in 1970 it was 510 m.p.h. in 1971 it was 520 m.p.h. in 1972 it was 530 m.p.h. in 1973 it was 540 m.p.h. in 1974 it was 550 m.p.h. in 1975 it was 560 m.p.h. in 1976 it was 570 m.p.h. in 1977 it was 580 m.p.h. in 1978 it was 590 m.p.h. in 1979 it was 600 m.p.h. in 1980 it was 610 m.p.h. in 1981 it was 620 m.p.h. in 1982 it was 630 m.p.h. in 1983 it was 640 m.p.h. in 1984 it was 650 m.p.h. in 1985 it was 660 m.p.h. in 1986 it was 670 m.p.h. in 1987 it was 680 m.p.h. in 1988 it was 690 m.p.h. in 1989 it was 700 m.p.h. in 1990 it was 710 m.p.h. in 1991 it was 720 m.p.h. in 1992 it was 730 m.p.h. in 1993 it was 740 m.p.h. in 1994 it was 750 m.p.h. in 1995 it was 760 m.p.h. in 1996 it was 770 m.p.h. in 1997 it was 780 m.p.h. in 1998 it was 790 m.p.h. in 1999 it was 800 m.p.h. in 2000 it was 810 m.p.h. in 2001 it was 820 m.p.h. in 2002 it was 830 m.p.h. in 2003 it was 840 m.p.h. in 2004 it was 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same—the turbine is power going for greater speed.

This may be illustrated in terms of the airplane market, as follows. Many airplanes originally equipped with, say, 200-hp. engines have been revised in design with the same models, with the same seating capacity and payload, now are equipped with engines developing as much as 400 hp. For another type of airplane, the increase may have been from 90 to 225 hp.

This increase in power, had it been accompanied by an increase in wages, would have permitted the shipyard to employ more workers. The increase, however, was effected with maximum speed in mind, and the final effect upon pay was, in general, to reduce it.

Payload carried has decreased both in proportion to horsepower and in proportion to gross weight. A study of these two trends showed decline in a majority of the quarters throughout the period.

Designing for high speed at the end

piece of jewelry, of course, is not necessarily poor practice, since a craft so designed may serve admirably for the purpose intended. Moreover, the fact that the average approved time airplane now carries less payload in proportion to engine horsepower and so proportionally gives weight thus liberally, is true in spite of the fact that some individual designs have been thought out unavailably with it paid as a primary consideration. It seems simply that a majority of the designers selecting new models have wisely-learned, unexpressed, the most desirable objective.

Another study of these two payload needs for airplanes of various weight classes clearly demonstrated that the planes intended primarily as cargo carriers were being designed efficiently from that point of view. It was found, by studying designs of planes varying from 1,500 to 24,500 lb., approved in 1959-60, that the larger airplanes were more economical and most efficient with regard to the ratio of payload to horsepower, and payload in per cent of gross weight.

With respect to payload as compared with engine horsepower, it was found that for payloads of 3,000 to 10,000 lb gross weight, the ratio was approximately 5 lb of payload to one unit of horsepower, as compared with about 2½ lb per unit of horsepower for smaller craft. Above 30,000 lb there was a very slight increase in payload as compared with horsepower as the gross weight increased.

With regard to payload in per cent of gross weight, the lighter planes again were most efficient. For airplanes weighing up to 5,000 lb the average varied between 15 and 20 per cent, with the heavier planes rating as most efficient. Above 5,000 lb, the percentage of payload climbed gradually with increase in gross weight.

This indicated that the heavy transport planes had been designed with consideration for their qualities as efficient load carriers, while the smaller planes, meant for carrying two or three passengers, were planned with less consideration for their ability to fly over rough terrain.

This phase of the study was considered to be of particular interest in view of the theory dogmatically advanced that the efficiency of human-thrust aircraft must necessarily decrease as size is increased. The theory could not be said to have been disproved by the results of the survey of approved type models, but at the same time the study did show that designers have not yet encountered the difficulties that theory forecasts.

In none of the trends that have been mentioned in the foregoing discussion has there been any great and sudden change. In each case the direction of the trend was definitely established, but the changes were found to be taking place at a conservative pace.

Trend to higher speeds

Likewise, with regard to speed of airplanes, the change was not sudden, nor was it great. The matter of interest in the study was that the trend was unmistakably toward higher speed.

Average high speeds varied during the period of survey (converging again being computed by quarter year) between the approximate limits of 161 and 137 mph. The speeds are referred to as being approximate because they are calculated values taken from the design according to an empirical table, and are not necessarily the actual or actual test results of individual models.

At the beginning of the period covered by the survey, the average top speed was 117 mph, and at the end of the three and seven-quarter years it was 126. Thus, the actual gain over the entire period was approximately 10 mph—the lower and higher limits having been touched during intervening quarters. There was times when the average high speed fell back somewhat

AVIATION
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August 1981

Average power and wing loading, partial, and specific of approved planes

		Average gross earnings per unit	Average gross earnings per unit	Average gross earnings per unit	Average gross earnings per unit	Average gross earnings per unit
Year	Quarter					
1927	Jan	12 00	12 00	12 00	12 00	12 00
	Feb	10 00	8 75	2 25	10 00	10 00
	Mar	10 00	9 00	1 00	10 00	10 00
1928	Jan	10 00	8 50	1 50	10 00	10 00
	Feb	10 00	11 00	1 00	10 00	10 00
	Mar	10 00	11 15	1 15	10 00	10 00
1929	Jan	10 00	11 00	1 00	10 00	10 00
	Feb	10 00	11 00	1 00	10 00	10 00
	Mar	10 00	11 00	1 00	10 00	10 00
1930	Jan	10 00	11 00	1 00	10 00	10 00
	Feb	10 00	11 00	1 00	10 00	10 00
	Mar	10 00	11 00	1 00	10 00	10 00

The trend in landing speed followed that for high speed—the two rising together.

The average trend of designs for the past four years or so has been, generally speaking, in the interest of high speed and at the expense of payload and landing speed.

In the last quarter of 1950 the study showed that speed had been gained without as much sacrifice as had been the case previously. There was an increase in average speed, and at the same time a marked increase in average payload in one part of gross weight and average payload per horsepower—presumably the result of careful and efficient design, since it would have been normal for payload capacity to have decreased with the increase in speed.

Landplanes predominate

To proceed to another phase of the study, it was found that landscape types predominated among the approved type models. Approximately 60 per cent of the total number of certificates issued were for landscapes. Scenographies accounted for about 7 per cent of the total, and architectural about 4 per cent. The number of flying boats was less than 2 per cent of the total.

Open desktop phones led sales places by a large margin at the beginning of the period, about 80 per cent of the approved types in the first quarter considered being of the open type. Considering the entire period, however, the division between the two types was almost equal. To be more exact, the average percentage of open types was approximately 33 per cent, and of closed types 65 per cent.

Monoclonals were found to have experienced a gain in popularity, as the as approved type applications were concerned. Although biplane types lost among approved type certificates at the beginning of the period, monoclonal types gained rapidly in number, and they exceeded biplane types during the

unnecessary to plot points and draw

For example, it was noticed that new uses were being found for metal. Many designs were assessed which involved steel tubing casings and stamped metal parts. In addition, the metal monocoque fuselage appeared in several designs.

Light plane applications

Toward the end of the period of the study a number of applications for approval of light, low-powered airplanes were received. These designs figured to some extent in the general averages for the latter part of 1930, but the approvals for these types were greater in number after the beginning of 1931, and the light airplane is really a trend of 1931 rather than 1930, as far as approval of types is concerned.

Development of shock absorbing gear in increased efficiency has reduced many designers to abandon the rubber shock seat in favor of compression gels employing rubber, compressed air, or oil. The latter two materials are the oil of wheel breakers, there has been a decrease in the use of oil seats—the oil seat being replaced by a third wheel.

From the viewpoint of the public, probably the most noticeable innovations have been those looking toward greater comfort for transport planes. These large craft have been equipped with comfortable reclining chairs, reading lights, and other amenities. The airlines, of course, intended solely for the immediate benefit of the passenger.

Each change that has been made in designing, whether a small weather vane in a robot fitting, or a substantial one like a change of structural design looking toward increased speed, was made with the idea of improving the airplane, making it more efficient, and better equipped to perform its task of providing speed and directness of route in air transportation.

Estimates of a potential large overkill due to spatial focus

Year	Quarter	Household population	Urban	Chad	The west and central	Other	Household population	Urban	The west and central
1959	1st	6	7	2	13	0	2	3	11
	2nd	6	7	2	13	0	2	3	11
	3rd	6	7	2	13	0	2	3	11
1961	1st	10	9	4	20	0	4	9	20
	2nd	10	9	4	20	0	4	9	20
	3rd	20	18	10	12	0	13	11	20
1971	1st	33	20	15	05	0	14	24	06
	2nd	33	20	15	05	0	14	24	06
	3rd	33	20	15	05	0	14	24	06
1980	1st	36	23	16	10	0	16	14	08
	2nd	36	23	16	10	0	16	14	08
	3rd	36	23	16	10	0	16	14	08
Totals	1st	111	88	42	0	0	49	80	38
	2nd	111	88	42	0	0	49	80	38
	3rd	111	88	42	0	0	49	80	38

Year	AIR (solid line)	SEA (dashed line)	FRESHWATER (dotted line)
1957	1.6	1.8	0.4
1958	1.5	1.4	0.3
1959	1.4	1.3	0.3
1960	1.4	1.2	0.3

Fewer landings, along with the, and against the background—the history of this average reflected, by quarter years on apparent decline. The Navy then show temporary trends.

The World Map at Edmonton, Alberta. The difficult surface conditions encountered there forced a take off from a gravel highway.



Nine days around the world

Mechanical aspects of the great flight,—equipment, preparation, and servicing

THE great achievement of Wally Post and Harold Gatty contrasts strongly with the often previous accidental attempt to fly around the world. Only seven years ago it took an expedition of the United States government more than five months to complete its circumnavigation. Post and Gatty, as the whole world knows, did it in less than nine days. Great as was the difference in time, however, there was an even greater difference in the conditions under which the flights were prepared for and made, differences corresponding to the difference between a government with unlimited resources, but working through the often sedate tools of political machinery, and a private expedition planned by men who had only themselves to depend upon and who were habituated to the shifting necessity of making limited money and saving gas as far as possible.

Post and Gatty ran out no advance parties to make arrangements for them. They depended on the normal facilities of the countries they visited. They and their equipment were a constant of attention,—only those which were absolutely indispensable. Having no governmental connection, the political questions which were so complicated when the Army flight was made, disturbed them not at all. American non-recognition of the Soviet government

did not paralyze them from crossing Russian frontiers. Arrangements were made through Amhurst, the Russian trade representative in New York, and were effective in guaranteeing any delays over passport or other formalities. In Russia and for other European countries regular airports and services were used, and very little was done in advance to prepare for the World Map's arrival. Language difficulties, naturally somewhat acute, were solved by personal authority in Moscow when they were out far the pilot the Russian equivalent of all the requests and questions that he thought he might want to convey to his helpers at the Siberian stop.

Stock mobile plane and engine

The plane was a stock Lockheed Vega built only in 1930, and was the same that was used by Post in winning the non-stop race from Los Angeles to Chicago in the Sikorski Air Race last year. A special hatch about three feet by two was cut from the top of the fuselage just at the leading edge of the

wing for the use of the navigator. The joints of the hatch swung upward, and a wind shield swung up to protect Mr. Gatty while taking notes.

In preparation for the flight most of the items had been removed from the cabin and an extra gasoline tank installed in their place. Other changes were made, and the total gas capacity was 240 gal. A 30-gal oil tank was used. The fuel feed from the wing tanks was by gravity, with an Alford-Division Corporation motor-driven pump for the cabin tank and a hand valve pump for use in case of emergency, which did not prove. The fuel system had the usual control by the pilot through a three-way valve permitting the drawing of fuel either from the fuselage tanks or from those at the wing. The 50 C. Brenne which the plane had originally borne was cancelled when the structural changes were made, and a standard engine replaced it.

Pilot and navigator, their equipment supported by the big fuselage tank, communicated through a speaking tube about five feet long. In the later

days of the flight, Mr. Post's headset had been affected by the constant roar of the engine and thereafter messages were passed to and fro along a wire.

The power plant was a Pratt & Whitney Wasp, completely standard except for the replacement of the model P to L blower by one geared 18 to 1, which raised the output to 535 hp, and substituted the engine from a Series C to a Series 3C on the manufacturer's list. The change of gears was made on the West Coast just prior to leaving for Roosevelt Field and at that time the engine first stopped from the factory on May 20, 1930, had had 245 hours of service, including the two stop flights from California to Chicago during the air race. The engine accessories were standard except for the substitution of a starter, which was left off to save weight. The engine was started by swinging the propeller, and that operation caused no undue mishap which might easily have been very strong.

The supercharging effect of the high-geared blower required fuel of exceptional quality. The gas and everything except the fuel was changed to 100-octane aviation gasoline, and had 1 cc. of ethyl fluid added to each gallon to give it an anti-knock rating of 92 on the engine scale. The gasoline furnished by Republic was excellent, but contained no ethyl fluid. To meet that emergency the center wing tank was filled with ethyl gas at Butte and was used without refilling for all take offs from there to Nome. After getting into the air the engine was switched from main fuel to the tank containing the Russian gasoline and then fed back to 1,700 r.p.m., at which speed no ethyl was necessary to prevent detonation. Thermometers, reading the cylinder-head temperatures, gave warning if detonation conditions were too nearly approached. At full throttle, the supercharged engine turned the master propeller, 9.2:2 in in diameter and with a 24-tooth pitch setting, at 2,200 r.p.m. at level flight.

Extra navigational aids

A number of extra navigational aids were carried. The normal complement of Pioneer instruments for cross-country flying was modified by the elimination of the ordinary turn and bank indicator, a Sperry artificial horizon and directional gyros being used instead. The two gyros contributed a total weight of 165 lb. The directional gyros serve essentially the purpose of a gyro compass, but has its correcting and self-aligning devices omitted and can be set in any course. Independent of rough air and of banking of the plane, it is nevertheless capable of wandering gradually from its own indication, and has to be checked up periodically against a magnetic compass. Two Rotec gyroscopic compasses were used for basic reference. There was no magnet or earth inductive compass. Navigation

proper was done with a drift indicator, Gatty's invention, and a bubble sextant. The sextant had divided D. G. plates, the first time that divided plates have been used on any of the great speedometer flights. They were of course intended to help the rating along, but the radio contact was of very low power and practically no use was made of it.

Four mechanical needs

The story at the mechanical features of the flight itself and of the servicing work before, during, and after is almost too simple to require telling. The machine was practically ready to start for Europe when it arrived at Roosevelt Field from Oklahoma and the only purchases during the weeks of waiting as the weather wore bad, hot and wet.

The latest of high pressure type gave a considerable amount of trouble during the period of preparation, but none during the flight itself. As Harter Green, valve distributor, was checked but no work was done. From the time of leaving New York and the arrival at Khabarovsk, 5,000 miles away, servicing consisted of refilling the gas and oil tanks and giving the usual attention to radiator area and other parts normally requiring daily lubrication,—nothing more. At Khabarovsk the Russian oil which was considerably inferior in quality to their product, began to tell and the valves

were changed. That made deep inroads on the supply of spare parts, as the entire servicing equipment carried on the flight was a standard tool-set and a complete set of spares.

At the next stop, Solomon Beach just outside of Sitka, the only structural damage of the flight was noticed when one wheel dropped into a hole in the field while taxiing, leaving the cowling over the wheel and one blade of the propeller. The propeller blade was straightened out and Mr. Post was quite willing to go on to the finish with it, but on arriving at Fairbanks, Alaska, Arrington, the Pratt & Whitney service representative in that part of the world, professed not to install a new pair of blades. It was at Fairbanks that Mr. Gatty's shoulder was injured by being struck by the propeller while cradling the engine. At Fairbanks, also, the oil was changed.

The next day over and Roosevelt Field resumed, the plane needed no attention before starting for the West. The regular twenty-hour check was given the engine, with no replacements found necessary except a new set of gears. The compasses, according to the man who supervised the work, were perfect, the connecting rods all in proper condition, and the valve gear free from any undue play. That that had gone all the way from Roosevelt Field to Khabarovsk Field seems shown as accurate in map of 0314 in



Post and Gatty with coffee and sandwiches to eat from them on the last leg of their flight. Roosevelt Field to Harbor Green.

efforts, desires of being underinsured in aviation technique who have sufficient cash in the bank to set up an individual policy of \$300. Credit can be sought through the insurance companies now operating in the aviation field, or the local bank may be asked to suggest and at least one-half to two-thirds of the amount involved can be borrowed from the bank on three to twelve-month paper. That is accomplished by having the group sign a joint note payable to the bank. The security is necessary as there can and should be enough "good names" on the note to guarantee to the bank the repayment of its loan. This is not theory. It has actually been worked out and applied. The commitment to the success of the group plan that the individuals comprising it be able to share equally the financial burden of the venture. A payment of at least \$150 in cash from each one is necessary in order to establish a certain basis of financial equities, although at some the first approach should in any case be made to persons whose interests and associations establish a certain social equality and responsibility. If a prospective member of the group can raise \$100 in cash it is fairly certain that he will be able to carry the other obligations. If he defaults, on the other hand, it is a comparatively simple matter to find a substitute. It can be provided in the by-laws of the organization that anyone defaulting loses what he has paid in and the money is applied to the amount required of the one who comes in to take the place of the defaulter.

In addition to the initial fee of \$100 there should be a monthly payment of \$15 to \$25 for about one year to return the note which has been discounted. The rate for cash will be about \$15 to \$25 an hour and \$5 or \$6 for the note. The club may lease money on the deal rate but should make money on the sale and build up a reserve which can be held in a fund to take care of overhauls and the replacement of equipment, or for the purchase of additional equipment. The insurance will be paid by the bank out of the money received for deal and the services of the local pilot or airport operator can be reduced on such a basis.

How much should it cost?

The weekly expenditure for flying time depends on the individual and the extent he avails himself of the opportunity to fly. It is probably well to assign at first \$25—one hour—but there is no limit to the top limit. It is wrong to leave it to the pilot and if private ownership is desired, it is vital to insist that the person who takes up aviation at the present time with the thought of developing it for his own use is in aviation for life, and the amount of money that he will spend depends only on his own capacity or desire. As the same rule it can be pointed out that there is no requirement for spending money above

and beyond the capacity of the individual at any particular stage. The president of the Midland (N. Y.) Aero Club, Clarence Dufford, found time to get a licensed commercial license and then did passenger carrying for the club and by last autumn had piled up over 200 hours. He estimates that it cost him between \$450 and \$500 per year for the 250 hours necessary to enable him to get a transport license.

The first year's expense for an old solo pilot for 10 hours deal and 20 hours passenger work would be \$600 to \$800. Expenses the second year would be less, with the plane paid for in full. As the economic justification for use of aircraft becomes more apparent and as the individual's training proceeds the desirability of aircraft as a factor in his own education will become more apparent. There it is obvious that the time is not far distant when use of planes will be commonplace, it behooves the individual to have something at his disposal as well as of his associates. The best way of acquiring this knowledge is in the most useful form is to get it first hand.

"Club" features

Any club should have certain "club" features, the most important of which it can utilize. The average flying club has ignored this phase, stopping the project to the first delusion of cooperative ownership. That not only endangers the stability of the group, even any group depends on personal ability to do what is required. The Coast Association of the Individuals, but not the operations of the group of a great deal of present interest. The flying features of the various parts of the British Empire furnish impressive examples of the part social activities may play.

The personal maintenance of the group, therefore, becomes of first rank importance. The individuals must be trained to do this, and to do this is the most obligation avoided. In some communities such groups already exist and merely need to be refocused to flying as a sport and means of pleasure travel. In others, the group must be established. Service associations, the transfer of resources, and banks are among the larger organizations within which individuals or groups may be recruited.

One of the most difficult obstacles to be overcome is the formation of the local club in the opinion of the local operator of the airport as flying school before, or after, he has been so much involved with the development of his school, or may interfere with development of his agency for a particular kind of plane, especially if the club decides against his particular make for its first purchase. Many operators, however, are not amenable to the changing trend within the industry and still

cling to the idea that there is a livelihood to be had training pilots for commercial aviation.

It is possible to point out to the local operator, however, that the group plan will provide additional revenue that might not otherwise be forthcoming. Five of the active members of the greater Amble (N. Y.) Flying Club had never been in a plane prior to the formation of the club and only three or four of the others had considered limited instruction. At its worst the flying club provides the local operator with less or involve new students at all one time.

If the community is to take advantage of the airplane, anything that encourages its development will be to the advantage of the local operator. It can readily be seen also that it is possible for the local operator to develop group ownership within his community on his own account.

The manufacturer's burden

The acceptance of group plans a definite burden on the manufacturer, as he has to take on the task of reaching the ultimate user of aircraft instead of having that task in the local operator and in the flying school. It seems apparent, however, that the local operator has been filled to a degree in distribution and a policy of dealer-to-consumer co-ordinating will provide the support required for a more effective distribution. It has been well established in other types of industry that close access to the customer does wonders for the factory to the consumer have effected definite economies and more efficient distribution. The development of group ownership by the manufacturer is a step in merchandising practice justified by experience in other and older phases of non-aeronautical industry. It has obvious advantages in that it brings the manufacturer into direct contact with the ultimate purchaser of his product and allows him to become familiar with the needs and desires of that class. It provides a direct sales outlet where it is not expensive to maintain as in the establishment of factory branches. The idea of making use into the field to counter their activity on the formation of flying clubs does not involve the withdrawal of branch offices and need not the need for such branches develop.

In short, the much misanthropic flying club marks a serious consideration of the aeronautical industry, not more than ever before. It involves a change in merchandising policy but that is in keeping with the times. Group ownership has its disadvantages but it is particularly useful as aviation merchandising to develop a market that cannot otherwise be reached. It is as useful to the individual as the advantageous means of taking up aviation until the piloting of aircraft becomes easier.

Reducing fire insurance costs

By

James P. Winsor

REDUCTION of 80 per cent in fire insurance premiums paid for coverage on its properties at the Chicago Municipal Airport has been achieved by National Air Transport, Inc. This saving effected by the operator of the New York-Chicago-Dallas air craft and passenger line is the result of the installation of one of the most complete fire-fighting systems to be found in the country.

The plan of the fire-fighting system was evolved by Ralph E. Hays, construction engineer of the airline, with the aid of Francis E. Slater, Manufacturer Mutual Fire Insurance Company engineer. The insurance company is one of the Pacific Mutual group. The equipment was supplied by Viking Automatic Sprinkler Company which has saved. The system cost approximately \$140,000. On a comparatively short time, however, the reduction in insurance rates is more than economic for the equivalent for the buildings and equipment at the Chicago airport are valued at \$500,000.

National Air Transport occupies three adjoining hangars along the Currier Avenue boundary of the field. Each has a two-story front to the street side. The construction of these buildings is not out of the ordinary, save for the fact that the hangars are equipped by single 14-in. brick fire walls. Elsewhere the walls are of 12-in. brick. The

Parade ground as it may seem, it is sometimes possible to save money by spending it. This is particularly true where protection against losses by fire is involved. The accompanying article shows how National Air Transport obtained a reduction of 80 per cent in fire insurance expense by spending \$140,000 for a fire protection system.



at different countries to cope with the most severe risks. No expense was spared. The system cost approximately \$140,000. On a comparatively short time, however, the reduction in insurance rates is more than economic for the equivalent for the buildings and equipment at the Chicago airport are valued at \$500,000.

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hangar roofs are of wood, and are supported by trusses. In the north hangar there are of wood, and in the other two, steel. The iron-to-iron, flat wooden roof and three level eaves. The north hangar, on the left, is 50 ft. in 30-ft. in width and 140 ft. in length. This structure and its contents, which cost over \$210,000, house the plane and equipment of the airline. The building is a two-story structure, with a two-story front to the street side. The construction of these buildings is not out of the ordinary, save for the fact that the hangars are equipped by single 14-in. brick fire walls. Elsewhere the walls are of 12-in. brick. The

With the exception of the pilot's quarters and the operations office, located on wooden pilasters, supported from the



Below: The smaller model in one of the P. A. V. buildings in operation. Left: Ralph E. Hays, N. A. T. construction engineer handling details one of the first systems on a country scale.

drugs below the connections, near the airplane itself in that structure can be removed only on the wet-spot principle.

Two well hydrants furnish a means of attacking a fire in the N.A.T. buildings from the street level. One of these, which has a four-way manifold, has been placed outside the pump room near the fire department connection. Water for this hydrant is obtained directly from the 6-in. overhead main and is controlled by a valve in the pump room. The other hydrant, installed outside the building at the back of No. 3 hangar, takes its water supply from the 6 in. branch of the main before it reaches dry valve. This hydrant has a recovery manifold and is controlled by a nearby valve. Suitable lengths of 2½-in. stand and fire department hose are provided at each of the two hydrants.

Roofs on roofs

Besides the sprinklers, the wall hydrants, and the fire hose, National Air Transport has a 5-in. monitor nozzle on the roof of each of its hangars. These have been installed to prevent the spreading of fire to the N.A.T. buildings from any of the nearby structures on the field or from the wooden dwellings across Centro Avenue and likewise the spread of fire from one hangar roof to another. Capable of throwing their stream a distance of 250 ft., the three monitors afford the widest in protection, not only to the N.A.T. hangars but all other structures within range. A fire hoseless hose connection near each of the monitors is also provided. This has a steel foot of 25-in. hose at level on the roof of No. 3 hangar for attachment to the connections.

Stowaway from carry the water directly from the centrifugal booster pump to the monitors and roof hydrants on Nos. 1 and No. 2 hangars. "Shut-off" valves for these are to be found on the pump room. The 6-in. supply line for the expansion on the roof of building No. 2, however, is a branch of the line running down the exterior wall to the wall hydrant at the back of the hangar. The flow of water in this line is controlled by a valve inside the structure.

The separate shut-off valves allow discharge of the water in the piping to the roof equipped with the device of cold weather. They also make it possible to stop the flow, preventing a loss of water, should a break occur in one of the lines discharging a fire.

There are two 40-gal. foam cans provided in each of the airplane hangars and in the control structure. In addition, a large number of 2½-gal. foam wet extinguishers and Pyrene are placed about the walls. In No. 2 hangar alone, there are 15 pails of this type of equipment.

A fire alarm system, as complete as any other of the fire-fighting equip-

ment, is provided at the N.A.T. headquarters. There are but two automatic alarms, however. These are 7-cycle water master bells, attached to the dry valves in No. 2 and No. 3 buildings. The opening of a sprinkler head on either one of the automatic will cause the bell in that hangar to start ringing.

The company employs a night watchman, but a fire originating in No. 2 or No. 3 unit after he had made one of his hourly rounds might go considerable lengths before it was discovered, were it not for the bells.

The fire alarm system is manually operated with the exception of the water master bells. Thick curtains of the ordinary door leaf variety are provided at severest strategic points in the N.A.T. hangars and their adjoining basements. There is also a push button on the suspended flying hangar to the south and the field post office to the north. Each section has its own signal and operates the large 11½-watt horns that have been installed in the hangars, as well as a bell mounted on the vestibule door in the ground offices.

Fire brigade organization

A complete fire brigade has been organized among the N.A.T. employees. Under Mr. Higgins, who is chief, are four assistants. Next in line is the battalion chief in charge of Nos. 1 and No. 2 hangars. The remainder are charged in charge of a crew of six men.



A card for production control

IN ORDER to maintain an unbroken material record of the production of the 1,800 parts entering into the construction of Boeing airplanes, the accompanying card has been developed. At the end of each day the work completed by the various shops is checked by the inspection department and the shop report forwarded to the production office, where it is recorded for quick reference on these data as cards develop so fit into an [V.I. file made by the Rossington-Rand Company

whose duties are to receive the plans from the hangars. Another assistant is in charge of the two men assigned to each of the chemical carts and hose lines. There is a similar organization in No. 1 hangar, except for a crew detailed to remove plan. It will be remembered that No. 1 unit is occupied by the various overhead shops.

A third battalion chief is in charge of the 2½-in. hose lines and the monitor nozzles on the roofs. Like the battalion chief in the north hangar, he has one assistant. Under these two are sixteen men assigned to the hose lines and hydrants on the street side of the buildings, those men detailed to operate the monitor nozzles, and five men to handle the 500-ft. hose line on the roof.

In view of the smaller force available at night, Mr. Higgins has appointed but one battalion chief in the evening crew and one on the morning.

National Air Transport holds fire drills at its Chicago headquarters regularly once every two weeks. A turn of the hose in the hangars and the teams on the roof at noon every day, the centrifugal booster pump is turned over once every five days. The Pyrene are dumped and refilled every six months, and the foam extinguishers every year, the water supply is inspected every 60 days by the insurance company. It is surprising that more transport lines, loaded with the necessity of perfecting defense, have not taken advantage of the method of reducing fire risks and cutting costs.

Some recommended practices for the maintenance of this highly important equipment



Refilling shock absorber struts

Servicing shock absorber struts

SHOCK absorbers are method in airplanes for long life, economy, safety and comfort of pilot and passengers. The most important of these is safety, since the safety and peace of mind of passengers and the safety of the aircraft are dependent on the proper functioning of the shock absorbers. A shock absorber is a device which absorbs the impact of bumps and jolts, and it is essential that it be properly maintained.

Shock absorbers are of two types: the oleo-pneumatic and the oleo-hydraulic. The oleo-pneumatic type is the most common and is the one which is most often serviced. It consists of a cylinder in which is a piston and a valve. The piston is connected to the axle and the valve is connected to the shock absorber. The shock absorber is filled with oil and the piston is moved up and down by the action of the axle.

The oleo-hydraulic type is a combination of compressed air and oil and has been found to be a more efficient shock absorber. It consists of a cylinder in which is a piston and a valve. The piston is connected to the axle and the valve is connected to the shock absorber. The shock absorber is filled with oil and the piston is moved up and down by the action of the axle.

and hard and losing its resiliency with its leaks and must be removed. It is essential that the shock absorber be properly maintained and that it be properly serviced. The shock absorber is a device which absorbs the impact of bumps and jolts, and it is essential that it be properly maintained. The shock absorber is a device which absorbs the impact of bumps and jolts, and it is essential that it be properly maintained.

Construction of the strut

The parts that comprise an Aerial oleo-pneumatic strut are (the figures refer to the accompanying chart): an alloy nickel steel cylinder (2) to which is attached a pressure pin (1), a specially constructed Schrader 15-pressure valve (11), a valve stem (8), plug and dust cap (12) and the lower piston rod to which is attached the piston head (3).

By

Louis F. Reiss

Chief Engineer, Tool Company

and the steel valve. In addition there are the packing seal (3), packing (4), packing gland (6) and packing gland lock nut (7).

The cylinder and piston rod, which constitute the principal wearing parts of the strut, are made of alloy steel common to aircraft practice, and are heat treated to the proper temperature in electrically-operated and automatically-controlled furnaces to ensure a maximum tensile strength of approximately 150,000 lb. per sq. in.

The lower tube is chrome-plated to insure long wear and rust resistance. The piston head is made of bearing bronze and the steel valve is made of steel.

Concerning valve by which the struts are attached as connected to the axle, the shock absorber is made from nickel steel and are also heat treated to ensure sufficient tensile strength and eliminate any possibility of leakage during service. Other equipment parts are constructed from materials adapted for their particular use.

Pressure and close inspection is given each part of the strut for which tolerances ranging from .001 to .005 in. must be maintained and held. Periodically complex orders of work are sent to the inspection department for a more thorough examination. After the last operation all parts of the strut are sent to the inspection department for final examination. The inspection department is responsible for the proper functioning of the shock absorber and the proper functioning of the shock absorber.

Assembly and testing

The lower tube is inserted in the cylinder and is followed by the packing seal to allow the packing to rest on the packing gland nut which is screwed into the packing housing. The latter is a part of the cylinder. Then the gland is locked with a lock nut.

While the cylinder is nearly collapsed it is filled with a specially compressed gas and the pressure of the gas is increased to the proper pressure. It is then inflated and tested.

After testing the strut goes to the



BIRMINGHAM

Birmingham, Ala., began construction of a 51,000-sq-ft municipal airport early last year and the new plant was dedicated May 15 (see p. 484). The site now is substantially divided and of that, with the exception of a 1,000-ft² runway of concrete apron, asphaltic concrete on a crushed stone and clay base. Two buildings have been erected: one is a large white brick administration building of Colonial design, the other a 10,000-sq-ft hangar and control tower. The tower is seven feet above from the post office, approximately a 10-minute drive from the Birmingham Airport in the morning.

Three outstanding
new airports

RENTSCHLER

The new 17,000-sq-ft airport at Rentzschler, Ill., was dedicated September 27 (see p. 484). It is the property of the president of Valspar Aircraft & Transport Corporation and will be used primarily in connection with the sales of their company located in Rentzschler, Ill. The Valspar Aircraft & Transport Corporation is a subsidiary of the Valspar Corporation, which is a subsidiary of the Valspar Corporation. The new airport is located on the Valspar property and is the largest of the three in the Valspar system. The new airport is located on the Valspar property and is the largest of the three in the Valspar system.

BATON ROUGE

Baton Rouge, La., dedicated its new 17,000-sq-ft airport June 15 (see p. 484). The new airport is located on the Valspar property and is the largest of the three in the Valspar system. The new airport is located on the Valspar property and is the largest of the three in the Valspar system.

Military and commercial gatherings progress toward
greater interchangeability and simplification

Standardization

A résumé of accomplishments of the recent AN Standards Conference and of the Standards Committee of the Society of Automotive Engineers

JUNE 1952, with the annual AN (Army Navy) Standards Conference at the Naval Aircraft Factory in Philadelphia. During the same week the Standards Committee and the Council of the Society of Automotive Engineers met to give consideration and final approval to a group of recommendations for new and changed standards from the Aircraft and Aircraft Engine Divisions.

The coincidence of the two meetings offers excellent opportunity for a comparison of military and industrial standardization methods and accomplishments. Comparison in any such comparison is the gradual passage of leadership in standardization work from the military authorities to the industry. While the S.A.E. made an active progress of standardization work, in 1952, it continued steadily to advance the results of the AN Conference and to accept for publication in the Society's handbook the standards that the Army and Navy had already adopted. Now, on the other hand, the industry has progressed so far toward taking control of its own standards work that in several cases, and especially on wheels and tires, agreement has been achieved at all points of great importance that the services had considered a prerogative to maintain. During the recent conference in Philadelphia, there was repeated reference to the initiative taken by the S.A.E. and upon several points the AN standards and specifications were modified in order that they might be brought into agreement with the S.A.E. In discussing aluminum alloy extruded shapes, it was agreed that the services should refrain from any action until the standards already adopted by the S.A.E. had been tried in service. At the AN Conference the industry is welcome to participate in the decisions, but action

is taken by, and upon the sole responsibility of, the Army and Navy. It assumes the final form of a command from the government services to the industry, leaving them the problem to be followed in doing business with the government. The progress of the S.A.E. work, on the other hand, following the precedent set in the Society's past standardization activities in the automobile field is primarily contractual and economic. This object is not so much to insure quality as to permit interchangeable manufacture of standard parts, making them available in modern production, by insuring interchangeability in the field to reduce the stock of spare parts that must be carried by service stations and operators. The Aircraft Division is headed by John F. Shanderson at the Naval Aircraft Factory, one of three governmental representatives among its 25 members. The others are experts of a more different type, especially on wheels and tires, representing the automotive industry, and of six inspectors from the Federal Bureau of Investigation. The Rapid Prototyping Committee, headed by Arthur H. Hix of the Wright Company, was an organization such from the Army and Navy and five from other aircraft engine manufacturers.

The scope of the S.A.E. work is obviously limited by the limitations of its purpose as just stated. The Aircraft Division does not concern itself with specifications for materials or manufacturing processes (except where they affect interchangeability), nor with design of design. In AN Conference goes into all these things. Among

the most discussed at Philadelphia, but without action, were the standardization of basic fasteners, the standardization of design and of any other characteristics to be used for well known sections, standard methods of static testing, and the standardization of methods to be made in calculating component fatigue.

Tires and wheels

Probably the most important concrete development of the two conferences was the adoption by the S.A.E. of a recommended practice (consensus but formal) for low-pressure tires and rims. It is the result of two years of discussion by a special subcommittee, headed by John R. Canby of the Goodyear Tire & Rubber Company.

The extreme low-pressure "turbo-tires" was not considered for standardization, as it has been a proprietary product, but the modern low-pressure tires now coming into general use were accepted in three sizes. Tires of 6.5, 7.5 and 8.5-in. diameter are to be recognized on the three basic rim diameters—9.5 and 11-in. tires will run on a 12-in. rim base, a 12.5-in. tire on a 14-in. rim and a 15-in. tire on the 16-in. rim. As has been mentioned, a standard's practice given the standardization of the following (in 1952) which has been the common practice with low-pressure tires.

First, for the low pressure tires were agreed to two types, designated here, the offset type being designed to provide more clearance for the brake drum. As for the low pressure tires were agreed to two types, designated here, the offset type being designed to provide more clearance for the brake drum. As for the low pressure tires were agreed to two types, designated here, the offset type being designed to provide more clearance for the brake drum.

the 4.5-10, and 2 in. on the 15-10, to 3 in. on the 15-12.

The recommended practice on high-pressure steel and rims was revised at this same meeting. Direct comparison of the data provided for the high- and low-pressure types and their characteristics for the high- and low-pressure types then becomes possible. High pressure tires are based on three tire wheel sizes: 10x3, 14x3, and 16x3, and in eight regular sizes extending from 26x2 to 36x4, with five extra tire sizes designed for use only on training for extra cushioning on a standard wheel. The rim and inflation pressures recommended, both in the high-pressure and the low-pressure types, for use with various static loads are shown in Table 1. Roughly speaking (within about 10 per cent) the recommended static load for low pressure tires is equal to $2D_0 D_1$, where D_0 is the base diameter of the rim and of the tire diameter, while the ratings for high-pressure tires are approximately $12D_0 D_1$, where D_1 is the overall diameter of the wheel. The static loads and inflation pressures for high-pressure tires are calculated that the tire will be flattened by 25 to 27.5 per cent of its diameter when at rest on the ground. The load factor for complete flattening of the tire at the specified inflation pressure and static loads is approximately 40, while the recommended practice calls for the wheels to be preinflated for a load factor ranging from eight to the smallest value down to five in the largest.

Taking, round and streamline

Another extremely important group of recommendations were adopted by the S.A.E. covering the dimensions and preferred sizes of steel and aluminum alloy tubing, both round and streamline. The subject was one on which Mr. Hagedorn has personally been very active. The list of preferred numbers adopted calls for a total of 43 sizes of round aluminum alloy tubing in standard 60-60-60 series, ranging from 1-in. diameter by 24 gauge (.002 in.) up to 36-in. diameter by 11 gauge (.020 in.). The recommendations are based on a general rule limiting the outside diameter of the tube to 18 times the wall thickness. The most popular sizes in aluminum alloy recommended to be carried in the largest number of diameters are 17 (.005 in.), 29 (.0042 in.), and 22 (.0039 in.).

A total of 88 sizes of round carbon steel tube and 94 sizes of round alloy steel tube are recommended, but the sizes to be used are limited to nine in number between 11 and 24, provided 12, 15, 17, and 25 being preferred for aluminum alloy but not for steel. The maximum ratio of diameter to wall thickness admitted is most in approximately the ratio as in the light alloy.

As for the use of steel, tubes of larger diameter in each size will be



Static load (in nominal lb.)	High pressure tire		Low-pressure tire	
	Tire size	Inflation pressure	Tire size	Inflation pressure
400	10x3	13		
600	10x3	13		
800	10x3	13		
1,000	10x4	10		
1,200	10x4	10	9-14x16	10
1,400	10x4	10	9-16x18	10
1,600	10x4	10	9-16x18	10
1,800	10x4	10	9-16x18	10
2,000	10x4	10	9-16x18	10
2,200	10x4	10	9-16x18	10
2,400	10x4	10	9-16x18	10
2,600	10x4	10	9-16x18	10
2,800	10x4	10	9-16x18	10
3,000	10x4	10	9-16x18	10
3,200	10x4	10	9-16x18	10
3,400	10x4	10	9-16x18	10
3,600	10x4	10	9-16x18	10
3,800	10x4	10	9-16x18	10
4,000	10x4	10	9-16x18	10
4,200	10x4	10	9-16x18	10
4,400	10x4	10	9-16x18	10
4,600	10x4	10	9-16x18	10
4,800	10x4	10	9-16x18	10
5,000	10x4	10	9-16x18	10
5,200	10x4	10	9-16x18	10
5,400	10x4	10	9-16x18	10
5,600	10x4	10	9-16x18	10
5,800	10x4	10	9-16x18	10
6,000	10x4	10	9-16x18	10
6,200	10x4	10	9-16x18	10
6,400	10x4	10	9-16x18	10
6,600	10x4	10	9-16x18	10
6,800	10x4	10	9-16x18	10
7,000	10x4	10	9-16x18	10
7,200	10x4	10	9-16x18	10
7,400	10x4	10	9-16x18	10
7,600	10x4	10	9-16x18	10
7,800	10x4	10	9-16x18	10
8,000	10x4	10	9-16x18	10
8,200	10x4	10	9-16x18	10
8,400	10x4	10	9-16x18	10
8,600	10x4	10	9-16x18	10
8,800	10x4	10	9-16x18	10
9,000	10x4	10	9-16x18	10
9,200	10x4	10	9-16x18	10
9,400	10x4	10	9-16x18	10
9,600	10x4	10	9-16x18	10
9,800	10x4	10	9-16x18	10
10,000	10x4	10	9-16x18	10
10,200	10x4	10	9-16x18	10
10,400	10x4	10	9-16x18	10
10,600	10x4	10	9-16x18	10
10,800	10x4	10	9-16x18	10
11,000	10x4	10	9-16x18	10
11,200	10x4	10	9-16x18	10
11,400	10x4	10	9-16x18	10
11,600	10x4	10	9-16x18	10
11,800	10x4	10	9-16x18	10
12,000	10x4	10	9-16x18	10
12,200	10x4	10	9-16x18	10
12,400	10x4	10	9-16x18	10
12,600	10x4	10	9-16x18	10
12,800	10x4	10	9-16x18	10
13,000	10x4	10	9-16x18	10
13,200	10x4	10	9-16x18	10
13,400	10x4	10	9-16x18	10
13,600	10x4	10	9-16x18	10
13,800	10x4	10	9-16x18	10
14,000	10x4	10	9-16x18	10
14,200	10x4	10	9-16x18	10
14,400	10x4	10	9-16x18	10
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14,800	10x4	10	9-16x18	10
15,000	10x4	10	9-16x18	10
15,200	10x4	10	9-16x18	10
15,400	10x4	10	9-16x18	10
15,600	10x4	10	9-16x18	10
15,800	10x4	10	9-16x18	10
16,000	10x4	10	9-16x18	10
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18,600	10x4	10	9-16x18	10
18,800	10x4	10	9-16x18	10
19,000	10x4	10	9-16x18	10
19,200	10x4	10	9-16x18	10
19,400	10x4	10	9-16x18	10
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20,400	10x4	10	9-16x18	10
20,600	10x4	10	9-16x18	10
20,800	10x4	10	9-16x18	10
21,000	10x4	10	9-16x18	10
21,200	10x4	10	9-16x18	10
21,400	10x4	10	9-16x18	10
21,600	10x4	10	9-16x18	10
21,800	10x4	10	9-16x18	10
22,000	10x4	10	9-16x18	10
22,200	10x4	10	9-16x18	10
22,400	10x4	10	9-16x18	10
22,600	10x4	10	9-16x18	10
22,800	10x4	10	9-16x18	10
23,000	10x4	10	9-16x18	10
23,200	10x4	10	9-16x18	10
23,400	10x4	10	9-16x18	10
23,600	10x4	10	9-16x18	10
23,800	10x4	10	9-16x18	10
24,000	10x4	10	9-16x18	10
24,200	10x4	10	9-16x18	10
24,400	10x4	10	9-16x18	10
24,600	10x4	10	9-16x18	10
24,800	10x4	10	9-16x18	10
25,000	10x4	10	9-16x18	10
25,200	10x4	10	9-16x18	10
25,400	10x4	10	9-16x18	10
25,600	10x4	10	9-16x18	10
25,800	10x4	10	9-16x18	10
26,000	10x4	10	9-16x18	10
26,200	10x4	10	9-16x18	10
26,400	10x4	10	9-16x18	10
26,600	10x4	10	9-16x18	10
26,800	10x4	10	9-16x18	10
27,000	10x4	10	9-16x18	10
27,200	10x4	10	9-16x18	10
27,400	10x4	10	9-16x18	10
27,600	10x4	10	9-16x18	10
27,800	10x4	10	9-16x18	10
28,000	10x4	10	9-16x18	10
28,200	10x4	10	9-16x18	10
28,400	10x4	10	9-16x18	10
28,600	10x4	10	9-16x18	10
28,800	10x4	10	9-16x18	10
29,000	10x4	10	9-16x18	10
29,200	10x4	10	9-16x18	10
29,400	10x4	10	9-16x18	10
29,600	10x4	10	9-16x18	10
29,800	10x4	10	9-16x18	10
30,000	10x4	10	9-16x18	10
30,200	10x4	10	9-16x18	10
30,400	10x4	10	9-16x18	10
30,600	10x4	10	9-16x18	10
30,800	10x4	10	9-16x18	10
31,000	10x4	10	9-16x18	10
31,200	10x4	10	9-16x18	10
31,400	10x4	10	9-16x18	10
31,600	10x4	10	9-16x18	10
31,800	10x4	10	9-16x18	10
32,000	10x4	10	9-16x18	10
32,200	10x4	10	9-16x18	10
32,400	10x4	10	9-16x18	10
32,600	10x4	10	9-16x18	10
32,800	10x4	10	9-16x18	10
33,000	10x4	10	9-16x18	10
33,200	10x4	10	9-16x18	10
33,400	10x4	10	9-16x18	10
33,600	10x4	10	9-16x18	10
33,800	10x4	10	9-16x18	10
34,000	10x4	10	9-16x18	10
34,200	10x4	10	9-16x18	10
34,400	10x4	10	9-16x18	10
34,600	10x4	10	9-16x18	10
34,800	10x4	10	9-16x18	10
35,000	10x4	10	9-16x18	10
35,200	10x4	10	9-16x18	10
35,400	10x4	10	9-16x18	10
35,600	10x4	10	9-16x18	10
35,800	10x4	10	9-16x18	10
36,000	10x4	10	9-16x18	10
36,200	10x4	10	9-16x18	10
36,400	10x4	10	9-16x18	10
36,600	10x4	10	9-16x18	10
36,800	10x4	10	9-16x18	10
37,000	10x4	10	9-16x18	10
37,200	10x4	10	9-16x18	10
37,400	10x4	10	9-16x18	10
37,600	10x4	10	9-16x18	10
37,800	10x4	10	9-16x18	10
38,000	10x4	10	9-16x18	10
38,200	10x4	10	9-16x18	10
38,400	10x4	10	9-16x18	10
38,600	10x4	10	9-16x18	10
38,800	10x4	10	9-16x18	10
39,000	10x4	10	9-16x18	10
39,200	10x4	10	9-16x18	10
39,400	10x4	10	9-16x18	10
39,600	10x4	10	9-16x18	10
39,800	10x4	10	9-16x18	10
40,000	10x4	10	9-16x18	10
40,200	10x4	10	9-16x18	10
40,400	10x4	10	9-16x18	10
40,600	10x4	10	9-16x18	10
40,800	10x4	10	9-16x18	10
41,000	10x4	10	9-16x18	10
41,200	10x4	10	9-16x18	10
41,400	10x4	10	9-16x18	10
41,600	10x4	10	9-16x18	10
41,800	10x4	10	9-16x18	10
42,000	10x4	10	9-16x18	10
42,200	10x4	10	9-16x18	10
42,400	10x4	10	9-16x18	10
42,600	10x4	10	9-16x18	10
42,800	10x4	10	9-16x18	10
43,000	10x4	10	9-16x18	10
43,200	10x4	10	9-16x18	10
43,400	10x4	10	9-16x18	10
43,600	10x4	10	9-16x18	10
43,800	10x4	10	9-16x18	10
44,000	10x4	10	9-16x18	10
44,200	10x4	10	9-16x18	10
44,400	10x4	10	9-16x18	10
44,600	10x4	10	9-16x18	10
44,800	10x4	10	9-16x18	10
45,000	10x4	10	9-16x18	10
45,200	10x4	10	9-16x18	10
45,400	10x4	10	9-16x18	10
45,600	10x4	10	9-16x18	10
45,800	10x4	10	9-16x18	10
46,000	10x4	10	9-16x18	10
46,200	10x4	10	9-16x18	10
46,400	10x4	10	9-16x18	10
46,600	10x4	10	9-16x18	10
46,800	10x4	10	9-16x18	10
47,000	10x4	10	9-16x18	10
47,200	10x4	10	9-16x18	10
47,400	10x4	10	9-16x18	10
47,600	10x4	10	9-16x18	10
47,800	10x4	10	9-16x18	10
48,000	10x4	10	9-16x18	10
48,200	10x4	10	9-16x18	10
48,400	10x4	10	9-16x18	10
48,600	10x4	10	9-16x18	10
48,800	10x4	10	9-16x18	10
49,000	10x4	10	9-16x18	10
49,200	10x4	10	9-16x18	10
49,400	10x4	10	9-16x18	10
49,600	10x4	10	9-16x18	10
49,800	10x4	10		

Flying Equipment

CONSOLIDATED TRAINER

THE AN-400 degree of the new model 21-A Trainer, of the Consolidated Aircraft Company of Buffalo, N. Y., has been designed to meet the requirements for minimum maintenance and greatest ease of inspection and servicing. The outstanding feature is

drift is conventional. It is a two-place open cockpit supported by long, straight wings of equal span and equal span with elliptical wing tips. For training purposes, it is to be powered with the Wright J-6 five-cylinder, 160-hp. four-cylinder, of the Continental seven-cylinder engine, all of which are rated at 173 hp. For advanced training, or where exceptional performance is required, it is to be fitted with the Pratt & Whitney Wasp J-6, or the Wright J-6 of 205 hp may be substituted. Fuel is carried in an aluminum tank located in the center section,

very interesting, and are covered in detail in the *Aviation* November issue of this month. In general, it is of the divided side type, of tubular aluminum alloy and steel construction, fitted with steel shock absorbers, semi-hollow items and bracing. The track is 64 in. The tail wheel will be described in a later issue. Tail wheel or tail is retractable. Both are retractable and retractable at 30 deg. in a full 360 deg. arc.

Landing gear is operated by push and pull rods. A special operating mechanism is used for the system which eliminates all exposed control parts and main. The mechanism is provided from both cockpit through levelled gear and bearing control with a non-rotating stop. Indicators are provided on each control in each cockpit. The fuel is adjustable from the ground only. Engine controls are direct

The Consolidated 21-A trainer



The Viking flying boat

this convention is in the extremely flexible complete expansion of hull bearing. The flight controls are fully ball-bearing at every connection, including all engine, rudder, tail, and main landing gear, and all other main attachment points. The bearings are made of stainless steel, are water and dust-proof, and require but one lubrication for the life of the airplane. The only wearing points at which ball bearings have been used are at the main fittings where the undercarriage is attached to the fuselage. At these four points, however, precision ball-bearing bearings are provided, fitted with aluminum thrust washers. The main bearing bolts are of hardened alloy steel, and the bearings are readily replaceable in the water without disturbing the fuselage structure. All bolts used at wing, fuselage, tail-plane and strut sections, etc. are tapered and hardened to take up any wear from vibration, and in maintaining the strength of such bolts the bearing stresses have been increased to be one-half the yield for the materials used. Particular attention has been paid to accessibility of important parts throughout the airplane. Maintenance repairs have been provided, and the engine mount leveling at the rear, and on the outer part of the fuselage forward of the rear cockpit is readily removable.

The general arrangement of the in-

stalling a capacity of 40 gal. For the higher powered engine installations mentioned above, an additional tank is provided in the fuselage under the wing.

The fuselage is built of chrome molybdenum steel tubing, and is designed with a desirable engine mount section. Wing tips are of laminated solid spruce with chrome molybdenum fittings, and are of heat-treated dural, and the entire assembly is fabric covered. Ailerons consist of heat-treated dural, assembled on a tubular dural spar, fabric covered. The attachment of the wing to the fuselage is through the medium of fabric fittings to reduce bearing loads below the aircraft of the type.

The detail of the undercarriage are

operating push and pull rods, there being no torque tubes used. Indirectly linked attachments are mounted on the wheels, which are completely covered with spruce rubber crash pads, 1½ in. thick.

The exceptionally clean lines of this airplane are due to the amount of thought expended on details which are commonly overlooked. For example, the most basic fire extinguisher is installed in a streamlined container partially on the outside of the fuselage and partially set into it so located that it can be reached either from cockpits or the ground. The starter switch, which ordinarily projects through the engine cowling is provided with a special telescopic extension and which is pulled out for cranking purposes and

completely retracted within the cowling in flight. The starting crank handle is moved in the starter compartment. Glass bearings and flexible lines completely enclose all the exposed fittings of the undercarriage. Push type hinged cover screws secure to the reinforced case girth.

The general specifications of the plane, as furnished by the manufacturer, follow:

Wing span	40 ft. 0 in.
Wing area	220 sq. ft.
Wing loading	20 lb. sq. ft.
Wing chord	10 ft. 0 in.
Wing tip	10 ft. 0 in.
Wing root	10 ft. 0 in.
Wing chord	10 ft. 0 in.
Wing tip	10 ft. 0 in.
Wing root	10 ft. 0 in.
Wing chord	10 ft. 0 in.
Wing tip	10 ft. 0 in.
Wing root	10 ft. 0 in.

VIKING FLYING BOAT

BASED primarily on a design originated by the Scherer F.R.A. Company, the Model V-2 Viking flying boat, manufactured by the Viking Flying Boat Company of New Haven, Conn., uses American construction methods, materials and equipment, and is manufactured under the Department of Commerce approved type certificate No. 250.

The machine is a four-place, full type, open cockpit biplane, powered with a seven-cylinder Wright J-6-18, engine, mounted as a pusher in a nacelle supported between the wings. The engine is connected to the propeller by a long, straight shaft. The engine is connected to the propeller by a long, straight shaft. The engine is connected to the propeller by a long, straight shaft.

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is linked to the hull by streamlined steel link rods.

The principal deviation from usual American design is in the hull, which is constructed entirely of wood, has a single step, and a flat-bottomed hull of the shape of the hull of the ball is shaped upward in a gradual curve to carry the tail surface well clear of the water. The general effect is a smooth, continuous line from bow to stern which is typical of many French flying boat designs. In addition to the flat bottom, the undercarriage allows that quicker take-off and smoother landings are possible on a bottom of this type. For comparatively small boats of low horsepower than for the same sized conventional boat.

From a landing and servicing point of view the flat bottom permits the boat to be shored up on a ramp or dry dock under its own power like a sail and the simplicity of the form permits even amateur workmen to make emergency repairs. It is claimed also that it can be landed on the ground because necessary, the flat bottom is essentially self-buoyant. The hull is provided with two lowering straps on either side on the nose, and a combined hauling grip and sail under the tail. The entire machine may be lifted in a sling attached to two lifting bars on the upper center section.

A rigid, gull-wing tail is located behind the rear cockpit in the hull, and a dorsal fin under the rear seat. The engine is supplied by a power-driven pump, supplemented by a hand pump for emergency use. The oil supply tank is located in the front part of the engine nacelle which makes any oil recovery system unnecessary.

The manufacturer's specifications are:

Wing span	40 ft. 0 in.
Wing area	220 sq. ft.
Wing loading	20 lb. sq. ft.
Wing chord	10 ft. 0 in.
Wing tip	10 ft. 0 in.
Wing root	10 ft. 0 in.
Wing chord	10 ft. 0 in.
Wing tip	10 ft. 0 in.
Wing root	10 ft. 0 in.
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PARAMOUNT FLOAT SEAPLANE

FEW airplanes today, outside of those designed specifically for the naval service, are designed primarily as float seaplanes. The average machine of this character is primarily a land plane which has been modified to operate on water by the removal of the usual wheels and the installation of float gear. The Paramount Aircraft Corporation of Saginaw, Mich., has placed on the market, however, a true float seaplane intended for sport use. They have departed from their usual silver-hulled design, and have developed in an out-of-the-ordinary open cockpit seaplane.

The machine uses two persons side by side. The power plant is a 130 hp. Pratt & Whitney engine mounted in a nacelle of conventional arrangement. Before meeting the Paramount type permit permit installation. When at rest, each attached to a short nose strut which is attached to the fuselage. When in flight, the struts are retracted. The float is made of a single piece of aluminum, and is attached to the fuselage by a single piece of aluminum. The float is made of a single piece of aluminum, and is attached to the fuselage by a single piece of aluminum.

Wing span	40 ft. 0 in.
Wing area	220 sq. ft.
Wing loading	20 lb. sq. ft.
Wing chord	10 ft. 0 in.
Wing tip	10 ft. 0 in.
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Wing root	10 ft. 0 in.
Wing chord	10 ft. 0 in.
Wing tip	10 ft. 0 in.
Wing root	10 ft. 0 in.

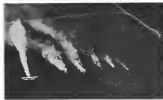
The machine is a four-place, full type, open cockpit biplane, powered with a seven-cylinder Wright J-6-18, engine, mounted as a pusher in a nacelle supported between the wings. The engine is connected to the propeller by a long, straight shaft. The engine is connected to the propeller by a long, straight shaft.

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Aircraft at Work



A keyplane scene of the Delta Air Corporation working on a field of cotton with ground clearing equipment.

Aerial photographs for golf score cards

THE Carlisle-Wright Flying Service photographic golf score cards is a result of the favorable reception of the idea when first introduced in the National Open Championships of 1948 at Wing Foot Golf Club, Roy, N. Y. At that time detailed records of the first ten of each hole and the hole of the last were made on photographic reproductions of the course as the leading players were in the hole. The most interesting record of course was that of the final play between Jones and Espinosa. The photographs used for the score cards were made in about a week of flying back and forth over the course by expert aerial camera men. First a complete air picture of the course was secured. Separate shots of each hole—making one, twenty and green—were made along lines developed in consultation with the club's officials. They were taken at an altitude of about 2,000 ft.

This style of work need add considerable interest to the scoring. It provides a permanent and accurate record of the play in important matches. It also affords the stranger in the course an opportunity for better judgment of his local shots. The whole act of a page of the score card is shown below.

Aerial survey for Venezuela oil sites

THROUGHOUT the work of L. E. Shelby with their Sikorsky S-35 amphibian the Circle Petroleum Corporation

Current-month photographs from Delta Corp.



No. 6—437 Yards Per Acre. Handicap 100 ft.



Dusting gains favor; air spray successful

DELTA Air Corporation, one of the world's oldest aerial dusting organizations, with headquarters at Houston, La., has recently extended its activities in California and the Southwest and reports a rapidly increasing application of aerial dusting to new uses. Recent contracts successfully completed included weeding and fertilization from the air.

A comparatively new development has been the application of oil from the air for mosquito control in swampy areas. This application of insecticide and fungicide by plane is now regularly being done for the protection of cotton, grapes, sugar cane, citrus, tomatoes, peaches, peaches, and apples. Other fields are steadily being developed.

The eight hole at Wing Foot. L. E. Shelby and his crew are seen in the foreground of this shot as they make the hole.

completed in April an extensive survey of the interior of Venezuela for oil sites which were conventional means of transportation, probably would have required about ten years. For about a year the plane was used under a license to survey the interior and a few exceptions of landings were made on waterways of the interior and along the coast as rough, unpaved landing fields. The machine was used also for transporting officials and payloads.

The only accident during this period of record service was caused by a turbulence which ripped the plane wing into its moorings and caused it, damaging the wing to the extent that a new one was ordered from the factory. The expedition carried three engines over a space. Every 120 hours, an engine would be shipped back to Hamilton for Pratt & Whitney service and a substitute installed. Spares and repair materials were not available at the base.

The plane carried a Pioneer Guller K-2 and Bushnell P-4 aerial camera for the survey work. It was the practice to make black and white on a pre-determined area and photograph a 100-foot strip of the ground. The photograph was taken at an altitude of about 2,000 ft.



L. E. Shelby with his C-119 Flying Boxcar, one of the Delta Air Corporation's fleet.

possibilities which caused ground operations. Much oil was found. Shelby had to make his own maps. He would fly down roads and make a photo of the ground, make a map and a scale, and then fly back to the base to develop a chart on which a road could be.

Technical Abstracts

WASSERKUPPE SOARING CENTER

REINHOLD BOHR, SOARING PILOT, CANTON, 1950, by Walter Gump, Jr. C-119 Technical Memorandum No. 421.

TO ALL out and out soaring enthusiasts with an interest in this sport, it is a pleasure when outlook programs on international aviation, this recent of the recently held Soaring Center is an inspiring document. To a technical soaring league for his countrymen to extend in all activities it is a profound disappointment. For any other man even to aspire to approach Germany in the field of soaring flight for organized and sustained effort, scientific study and education, and some recent record breaking achievement, seems as hopeless as for the University of Prague to elect a dean to teach a football team from Notre Dame.

Two difficulties have the state in 1950, the first was the general financial depression which made it difficult for a school to do so much for a school for these years and participating, and for these reasons the men to collect sufficient money for the expenses incurred. The second was the weather

Only one of the winter events days provided any flying at all and on these two and clouds were prevailing. In the face of these conditions it is nothing less than remarkable that previous record performances were generally achieved. Even some outstanding work the improvement in the number of those who made noteworthy flights.

Of great significance in the work of the center was the flight of 131 flights by Kreibitz which last his position was attained by about 5 miles. There had previously been a record of 100 miles set by Kreibitz in 1948. The flight was made by Kreibitz in 1948. The flight was made by Kreibitz in 1948. The flight was made by Kreibitz in 1948.

Dr. Gump brings out the importance of the 1950 season. Flights at completely planning each flight in advance. So for only Kreibitz and Nollinger were to have done this. One must carefully study the terrain at each point on the proposed route under the accepted air conditions, have a course completely plotted on the map, and have a very definite plan at each point to the flight. Kreibitz is no pilot.

only pilot who was not usually visible who was first thought to be flying with outstanding before morning at which point.

In the altitude flights the previous year a record of 2,087 ft. was achieved by Kreibitz in 1948. The flight was made by Kreibitz in 1948. The flight was made by Kreibitz in 1948. The flight was made by Kreibitz in 1948.

In 1950 for the first time clear soaring flights were in flight over the entire length of the Watterkuppe. In 1950 the number was increased to fourteen at nearly half of the gliders participating in the various flights. The flight was made by Kreibitz in 1948. The flight was made by Kreibitz in 1948. The flight was made by Kreibitz in 1948.

In the future, it is hoped that the center will be able to make more flights in the future. The flight was made by Kreibitz in 1948. The flight was made by Kreibitz in 1948. The flight was made by Kreibitz in 1948.

ALLOY STEEL WING BEAMS

DEVELOPMENT OF STEEL WING BEAMS FOR AIRCRAFT, by J. C. Kray and J. C. Kray, Jr., NACA, Langley, 1950, 1951.

CERTAINLY the most complete article on steel published on steel wing beams in this by Mr. Kray and Mr. Kray. Alloy steels are available in the form of steel with steel strength as high as 200,000 lb. per sq. in. Such material, if it is not strengthened by heat treatment, is not as strong as steel. The alloy steel is not as strong as steel. The alloy steel is not as strong as steel.

ments in this service is obtained through the concentration.

There are two hangars on the field. The larger hangar, opened for general maintenance, has a clear floor space 125 ft wide and 146 ft deep. The aisles are parallel with the right side of the field and the shop located, measuring 48,000 sq ft adjacent to the building on the far side. The office located on the field side, is likewise of new steel but measures 20,000 sq ft. It is finished in Colonial style. Landing off the large ramping nose is the aisle of the port stairway. B. L. Whelan.

The other hangar, which is leased to the Pratt & Whitney Aircraft Corp. for experimental purposes, has a floor space of 12,000 sq ft. This will be occupied eventually by the use of the other building. It has a new steel office space to add shop space.

The hangar has a new layout in order for the working of aircraft. The platforms or places of the aisle are fixed back with the floor and form a better floor. The top of the "T" is the plate for the wheels and the long area is for the tail sled. Any new machine may be accommodated. While holding the plane, people easily adjust some of the apparatus and working of the system.

The buildings are of steel and brick construction. They have both sprayer and delay type systems and supplementary fire apparatus. The field is all-way with turf surface and is drained by 40,000 sq ft of metal culvert.

As a contact medium between the United companies and commercial aviation, the field is available to any pilot. A number of Colonial transports have been housed there over night for instance while the machines have been worked in their regular run. Any make of engine may be overhauled in the shop, which has a capacity of 500 of the Pratt & Whitney types.

Descriptive folder helps the port and the visitor

COMPLETE information about the facilities at airports for the benefit of visitors, whether they come by land or by air, serves a three-fold purpose. The pilot is told the name of the emergency operating at the field, the services they render and what accommodations are available. The spectator is given a bird's-eye view of the plant, its purpose and functions and thus initiated into an intelligent understanding of operations which otherwise might seem somewhat mysterious to him.

There are two descriptive examples of airport folders. One is prepared by the Aviation Bureau of the Boston Chamber of Commerce and is equally informative for Travelers and Pilots. A new showing the location of the Municipal Airport in relation to Greater Boston is



Descriptive folder of St. Louis Chamber of Commerce and the Boston Chamber of Commerce

supplemented by photographs of various buildings and parts of the airport. The folder is the best of the radio book, the various companies operating on the field and their services.

Another excellent example is a pamphlet entitled Air Transport published by the St. Louis District, which is published by the Industrial Club of St. Louis. As the same implies this covers more than one port but happens to give more space to the Lambert-St. Louis Municipal Field. Its local map is supplemented by a map of the United States showing St. Louis' relative position in regard to important cities throughout the country.

Traffic signals tentatively adopted

TO MEET problems of traffic control which are growing acute at a number of new airports, and to prepare for adequate control at other ports as traffic increases, the Airport Section of the Aviation Committee of the Department of Commerce has taken preliminary steps to formulate procedures and mechanical aids which will be both adequately effective and standard for all ports. This action was initiated at the Third Annual Airports Conference of the section at Tulsa in March, and is being carried on in cooperation with the study of the problem on the part of the airport section of the Department of Commerce.

The Chamber's committee studying that problem has taken the form of a study of two divisions, one made up of East Coast managers and the other of West Coast managers, for the benefit of geographical representation. The member includes George W. Orr of Roosevelt Field, chairman; Richard W.

Albion, Newark Municipal Airport; W. Sanger Green, Central Airport, Camden, N. J.; and Herbert H. M. M. M., Houston Field, Hartford. The latter includes Col. R. B. Barlow, chairman, Director of Airports of the City of Los Angeles, Fred Denham, United Airport, Newark and Major C. C. Mosley, Grand Central Air Terminal, Glendale, Cal.

The East Coast division held its first meeting in New York City June 17 and, having no deliberation in control of planes in the air, evolved a traffic control system which the entire committee will study for probable recommendations to the whole Airport Section. The mechanical system proposed is based on experience with a landing gear used for starting planes at the busy Washington Airport, serving the District of Columbia, and a four-light gear system developed at Newark.

The Washington gear was described in this section of the May issue of AVIATION. The Newark system goes further than the Washington device and has three lights—red, green and amber, probably under such a sound-light. The latter two are equipped with 12-in. lenses to limit the spread of the beam. The red light is fixed and shines vertically upward, permanently, visible in all directions. The green light is on a movable base so that it can be directed at the plane as the air and the amber light is movable so that it can be directed to that area of the airport where it is desired the plane should be located.

When a plane arrives at the airport the pilot enters in the usual manner, but continues beyond the control light. He would be used the green light. This is pointed at him by the operator and is powerful enough to attract his attention as he comes in. His own plane is in the landing, nothing as he does so while the yellow spot from the amber light is located. This is directed also by the operator. It shines through the four-light glow, making a distinct oval of light about 14 ft in diameter on the airport surface.

The amber light is in reality part of an emergency device to direct a pilot to a clear part of the field in the event of a breakdown of the operation of some other light situation on the landing area. The red light is kept burning permanently in order to enable the operator to select planes to land in turn when they then arrive over an airport at about the same time. All can see the red light glow and will remain in the air until it is signalled by the green. This is supplemented by the green. The operator is able to sight along the barrel of the green gun and pick out just the plane desired. Having "serviced" that machine he shifts the light and follows the plane until it is on the ground. Then the green and amber lights are extinguished, leaving just the red light burning, until the operator picks out the next plane to land and "shoots" it with the green light.

Servicing Short Cuts

STATIC ELECTRICITY SAFETY MEASURE

IN order to insure that an airplane structure is at zero electrical potential while an attempt is made to do its ground tasks a simple grounding device has been developed in the shops of the Ludington Lines at Washington. To the framework of the steel stabilizer regularly used to give access to the tanks a short length of flexible electrical conductor cable has been welded which extends on its line and a large clip con-



A simple grounding device prevents a discharge of static electricity during fueling operations

nect to those used in making external connections to storage batteries while fueling. As the servicing unit discharges the fueler with the ground hose, he causes the clip to the steel covering of one of the wing engines and grounds with the refueling nozzle clinger at five feet from the check area of static electricity to the base nozzle.

PORTABLE WORK BENCHES

CONSIDERABLE time is saved to mechanics in the shop of Eastern Air Transport, Inc., at Mexico, Co., through the use of portable work benches, which make it unnecessary for a man to carry a part on which he is working to some other place. Benches are solidly constructed of hard wood and are mounted on four heavy cast-iron wheels which permit pushing from place to place with a minimum effort.

Each is equipped with a large vice and a drawer containing the small tools. Each department is assigned one or more benches and the equipment they contain varies, depending upon the work which the particular department performs. In order to avoid confusion the name of the department is stenciled plainly on each bench.



Roll mounting for engine engine

SERVICING LAYOUT FOR PROPELLERS

THE equipment and layout of the Ludington Lines at their Washington, D. C., shop for servicing the propellers of the engine elements is shown in the accompanying photograph. It is to be noted that the purpose of good lighting for making visual inspection of propellers has not been overlooked in selecting a location for the shop. The arrangement of racks, sliding ladders, provisions, and balancing stand makes for convenient handling of the aerial operations. Note also the portable electric buffer which can be moved easily and quickly to any desired location.

Propellers are inspected on the place at the end of each run, and at the regular weekly airplane check-up. With the removal of engines from airplanes at the end of every 300 hours of operation, the propellers are removed and sent to the propeller shop for a thorough checking. They are examined carefully for mechanical changes, in special for signs of fatigue cracks and

checked for pitch, balance, and tracking before being returned to service.

STANDS FOR RADIAL ENGINES

FULL persons of storage, or for making minor adjustments, the Athens Co. shop of Eastern Air Transport, Inc., in order an important engine inspection device. A welded steel framework, consisting of tubing and angle irons, is made up to resemble the nose of a fuselage. This framework is attached to wooden supports arranged freely on a solid wall and strains on its other face a new or used crankshaft in the mounting hole holes on the engine. The engine is mounted on the stand, which are fixed in a position where adjustment work may be performed conveniently.



The Ludington propeller shop at Washington

The Buyers' Log Book

Small floodlight

Designed for use where requirements for small floodlighting units a new small size general utility floodlight projector has been announced by the General Electric Company of Schenectady, N. Y. The unit weighs less than 3 lb and measures approximately 9 in wide, 10 in deep and 13 in high. It is built for a 100-watt standard service incandescent lamp. The housing is completely waterproof for outdoor service.—*AVIATION, August, 1931*

A spring and ring tester

In automobile and airplane engine construction it is important that valve springs and piston rings be checked for proper compressive strength. In either case, weakness or excessive resistance are causes of faulty operation and usually high rate of wear in moving parts. A combination piston ring and valve spring tester designed to compare the strength of rings and to measure the compression strength of springs, has been put on the market recently by the Toledo Precision Devcon, Inc., a subsidiary of the Toledo Scale Company, Toledo, Ohio. This apparatus which is designated as the Auto-Gage, is adjustable to any size of valve ring, and measures the strength directly on the neck. The compressive resistance of valve springs is also indicated directly



General Electric small size floodlighting unit

The Auto-Gage can be furnished either as a spring testing device, a piston ring testing device, or as a combined unit.—*AVIATION, August, 1931*

Potentiometer

An instrument which is adaptable for the controlling of temperatures in a number of all types is being produced by the Bryens Instrument Company of Philadelphia, Pa. The machine is a combination controller and recorder which not only maintains furnace temperatures at predetermined levels, but

also drives a continuous time-temperature chart.—*AVIATION, August, 1931*

Radio shielding

With the increasing use of radio on business airplanes, it is essential that all sources of electrical disturbance be thoroughly shielded to prevent interference with reception. A new type of radio shielding for the spark plug system of Pratt & Whitney (vertical) engines has been developed by Mr. Walter A. Handlin, vice-president and chief engineer of the Aero Corporation of California.

The Handlin shield is made up of two units interchangeable with the standard equipment supplied with Waag and Horst engines. It may be installed without removing the engine from the airplane and is so designed that it does not interfere with standard servicing. By its use, approximately 25 ft. of standard exposed wiring on a Waag engine is eliminated. The entire assembly is water and gas tight and is designed with an electrical safety factor of ten.—*AVIATION, August, 1931*

"The Boxer Shop"

A combination woodworking machine known as the Boxer Shop, has been developed by the Porter-Cable Handicrafts Corporation of Syracuse, N. Y., the manufacturers.

The tool combines an overhead cut-



Above: Porter-Cable Handicrafts "Boxer Shop." Right: Complete Handicrafts table standing with Ring angle

off saw, table top saw, planer, belt saw, lathe, shaper, mortiser, and boring attachment and constitutes a complete woodworking shop in one machine.—*AVIATION, August, 1931*

Welding bloopipe

Designed particularly for airplane fuselage, or other light welding work, a new welding bloopipe has been announced by the Lacle Air Products Company, 285 East 42nd St., New York City. The bloopipe is 10 1/2 in. long and weighs 10 lb. Six different sizes of standard type are available. The particular advantage of the new bloopipe over other equipment lies in its continuous and lightweight nature. It is easily handled when hot and accurate work is required.—*AVIATION, August 1931*

Morher light

For outlining airport runways, a flash-type marker light has been produced by the Westinghouse Electric & Manufacturing Company, Bayview Park, Cleveland, Ohio. The units are installed in the ground with the upper edge of the lens ring flush with the surface and function after no obstruction to a plane passing over it. The maximum projection at the center of the lens is 4 in. Lenses are self-cleaning, strong to carry the weight of a glass, and are supplied in several reflective colors. The housing is of cast iron and is completely waterproof.—*AVIATION, August, 1931*

Magnetic compass

The Elgin National Watch Company of Elgin, Ill., has announced a new magnetic compass for aircraft in which a new method of card engagement is employed to stabilize the compass against vibrations. A coiled spring is interposed between the pivot and the



other magnetically sensitive elements of the compass. Six inches of the card is a result of the action of the spring which is attached to the pole pieces and windings may be returned from the front and a new unit substituted. It is claimed that a motor may be required in this manner at about one hour when spare units are carried in stock.—*AVIATION, August, 1931*

interest to small shops having motor-driven machinery has been announced by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa. The new motors are made with the electrical and mechanical parts assembled in such a way that if wear develops on the rotor stator (including pole pieces and windings) may be returned from the front and a new unit substituted. It is claimed that a motor may be repaired in this manner at about one hour when spare units are carried in stock.—*AVIATION, August, 1931*

Pontooners

Designed especially for use with the light airplanes which are now becoming popular, the Aero Products Corporation of Detroit, Mich., has introduced a set of light-weight floats which can be readily attached to the standard landing gear without making extensive changes in the primary structure. The floats are so designed that the cross members usually found on larger models are eliminated, which decreases the load resistance on the water and in the air. The floats are of the conventional two-bay type, single step design



Aero Products floats for light airplanes

Aviation Corporation of Dayton, Ohio, subsidiary of Bendix Aviation Corporation. These units incorporate an individual lever for controlling each engine and also a master switch to cut off all engines simultaneously. They are arranged in compact housings for instrument board mounting.—*AVIATION, August, 1931*

Westinghouse motors

A compact idea in electric motor construction which should be of particular

bulk of dimensions also covers gear action to the several compartments, for simple duct fittings are provided for attachment to the airplane. The weights of each float is 30 lb.—*AVIATION, August, 1931*

Immersion heaters

A series of electrically heated immersion heaters for warming up oils are being developed by the General Electric Company of Schenectady, N. Y., in its Toledo, O. A-



Above: The Bryens Potentiometer. Right: The Auto-Gage spring and ring tester



254-B. These seats are put up in a wide variety of forms, applicable to a number of different purposes, among which is the pre-heating of lubricating oil for cold weather operations of aircraft engines.—*AVIATION, August, 1931*

Navigation Aids

A new series of the Type 584 navigational light has been announced by the Patent Improvement Company of 254 Lexington Ave., Brooklyn, N. Y. The units come in a variety of forms, designed for use on wing tips, rudders, etc. and are designed for use in installation and maintenance, and low parasite drag. All lenses are glass, and are held in place by spring snap rings.—*AVIATION, August, 1931*

Catalogs

United States Steel Corporation. Bulletin and hand-counting sheets for all purposes are fully described in a new bulletin issued by the United States Steel Corporation. Numerous illustrations of typical applications supplement the detailed description and specifications of the various alloys.

The Lincoln Electric Company. Complete equipment for electric arc welding is covered in bulletin 3399, issued on Feb. 1, 1931, by the Lincoln Electric Company of Cleveland, Ohio. The booklet covers not only welding machinery and tools, but also lists machine and safety clothing for the protection of the operator.

George Perinelli & Company. An elaborate bulletin describing the Perinelli Patent Monoplane has been received from George Perinelli & Company at Park Road, Bristol, England. This machine, which has been designed primarily for use as a full scale aerodynamic laboratory and aviation ball-balloon experiment, is described in detail and performance data are given. Three motors showing note, plus and three views of the machine are included. Duralumin, Dural, Lucite, Company. Standardized steel lockers and metal cases suitable for use in manufacturing plants and airport shops are described in a bulletin entitled "The Locker Shop" issued recently by the Duralumin Steel Locker Company of Aurora, Ill.

Caterpillar Tractor Company. Issue No. 37 of the Caterpillar magazine shows a number of interesting applications of tractors built by the Caterpillar Tractor Company of Peoria, Ill. Machines of the type illustrated have been used in the preparation and maintenance of airports and airport approaches.

Side Slips

By ROBERT H. OSBORN

MESSRS. Post and Gatty certainly *do* have a rounded out complete advertisement for all seasons of their flights also on demand—the same they intended for their good place. Just look of the millions of dogs, trained seals, seabirds, motorboats, etc., which is the country, coming, children and parents that are going to be named "House Mac."

It must be tough for the new students, whose chief interest in flying is the fluffy animals with helmets, goggles, rubber boots, and all that to have a couple of men fly around the world in record time without hats and wearing only business clothes.

Mr. W.B.T., Jr., of Boston, Mass., found on time in the Boston Post which shows that the boys landed a mail or two on their flight around the world.

"LARGE PLANE DO MOST WORKS IN HOME," Roosevelt Field, N.Y., July 1 (AP).—When Harold Gatty, the Winnetka, Mass. plane, was in by 150 policemen, he dropped his right wing and slid to the left of its own field, the ground Straightaway. Then, he dropped the left plane gently into the field facing away from the crowd as there would be no possibility of stirring any of the over-enthusiastic women.

Speaking of over-enthusiastic women due to information that so many record flights have to be made from or to Roosevelt Field N. Y., or rather, it is unfortunate that such a perfect field should be within the district of the Nassau County Police. So many great aviation achievements have taken place since held at various fields and the Nassau County Police have hardly found an opportunity for their great fun of taking up the people who were interested enough in the start to have to see it. The following incident which we witnessed is a good example of their methods. When Lindbergh landed from his Paris flight he landed in Mitchel Field in a pursuit, threatening to an airplane which landed late in New York harbor. An avowed newspaper photographer was running along about on getting a piece of the landing. He was not into his plane, held by a police officer, in a motorcycle who wasn't even looking in that direction. The photographer was not speaking and by camera damaged, and so he picked himself up and told the officer "Why didn't you look where we were going with that?" The police

captain who had also witnessed the incident ran up and said, "Is that man arguing with you? Throw him off the field." The last we saw of the poor photographer he was being half off toward the gate by two policemen.

Mr. W.B.T. of New York City, made in a flying which gives a good explanation, at last, for the delays encountered by the Dunder Go-X on its trans Atlantic flight; they must be redesigning it completely. "Tearout House Dunder Go-X on John Harman," *Schenectady (N. Y.) Gazette*

"The mail plane passed overhead, they heard the strong motor of the engine, the best of the great wings,"—from *Courtesy of the* for July.

Mr. T.G. of Chicago suggests the following logical ending for the sentence: "When I and another catnap for the first."

The following letter, originally addressed to "Bunny" C. was mailed in to us by Mr. R.S.D. of St. Louis. We expect it to be the next report to be about in the state of mind, most of us, from trying to make our own aviation problems.

"Dear Sir: You found it very hard to correct any person or party. I feel well keep on trying. I have a small wood fish made of an idea. Which I know that the world wants today. I have not filed for patent on cause. And with me to do so if any organization wishes to take hold of mine and show me compensation. I think it rather funny that I don't investigate. In a small attachment that will when adjusted cause a complete in lift and come down slowly, travel slow. At any time, if so wishes. Plans to enter control at all three under any condition of weather. A full plan is in progress. These designs I can guarantee and if I fail there is no harm done by investigation. I need help in this matter. And you may need it too before we get done with it. I wish that some one would tell me the right thing to do. I'm no pilot never flew a plane. But have any way of thinking. Concerning this. And don't think I fail. Let's hear."

P.S. This letter is for any person whom you might see correctly give us more protection, which had to be a written contract.

That one sentence "I so wish that some one would tell me the right thing to do" would make a good design for the whole business just now.



Timken has 18 Bearings on the Boeing Monomail

Advanced interpretations of efficiency, dependability, ease and accuracy of control and safety, are seen in the progressive use of Timken Bearings in this aircraft, which, its builders say, carries the heaviest pay load at the highest cruising speed of any single-engined airplane in service . . . 18 Timkens are installed at the following vital points: 4 in the Bendix landing wheels, 8 in the landing wheel retracting mechanism, 2 on the aileron control, 2 on the control stick and 2 in the tail wheel . . . The designers have thus

not only conquered friction, but have thoroughly protected

their ship against radial, thrust and combined loads

as well. Specify Timkens. The Timken

Roller Bearing Co., Canton, O.



THE WORLD'S SPEEDIEST



COMMERCIAL AIR LINES
fueled and lubricated
by **TEXACO**

THE Boeing Air Lines, Inc., with four commercial passenger lines between cities of Texas and Oklahoma, operates 11 daily scheduled flights regularly over the four routes. It is the first 175 mile-per-hour passenger service in air history and the fastest scheduled air-line operation in the world. • Lockheed Vega and Oivon planes are used averaging about 4500 miles per day. Texaco Aviation Gasoline fuels all the planes and Texaco Airplane Oil and Texaco Marine Grease are the lubricants. • It is 100 per cent Texaco with the Boeing Air Lines. Nothing less than super-quality products would serve. • The Texas Company in developing special airplane fuels and lubricants, and in its furtherance of commercial aviation, the test and service flights of its own planes and the record-breaking flights of Captain Hawks, has done more, perhaps, than any other oil company to advance the feasibility of fast scheduled air transportation. Texaco Aviation Products are distributed at airports throughout the country.



THE TEXAS COMPANY

155 East 42nd Street, New York City

TEXACO AVIATION GASOLINE
TEXACO AIRPLANE OILS
TEXACO MARFAK GREASES
TEXACO AERODIESEL FUEL
TEXACO ASPHALT PRODUCTS

(FOR SERVICE, HANGAR RENTALS AND REPAIRS, AND OILS [LUBRICANTS])



HOW ABOUT THE PRICE of Airwheel Safety?

If you think that you can't afford the extra safety that Airwheels give to your ship and pilot—here's a surprise for you.

For several months now the cost of Goodyear Airwheels and the new Airwheel roller bearing brake has been about the same that you'd pay for ordinary wheel and tire equipment.

You pay no heavy premium for the protection of real low pressure — which only Goodyear can give you — the protection of great soft pillows of rubber which roll over mud, sand, snow or ploughed ground.

You pay no heavy premium for brakes so sure, so smooth, so powerful in their action that they will "stop on a dime."

Maybe you think you don't need such equipment for ordinary landings. Maybe it's a fact that you don't.

But when you do need them—it may

save the price of a good ship to have them on.

Only Goodyear can give you Airwheels safety. Why take chances with less protection?

For full proof of what Airwheels can do — write to Aeronautics Department, Goodyear, Akron, Ohio, or Los Angeles, California.



When you buy a new ship specify Goodyear Airwheels

GOODYEAR

EVERYTHING IN RUBBER FOR THE AIRPLANE

THOMPSON PRODUCTS, INC., MANUFACTURERS OF AIRCRAFT VALVES, USE

TELETYPEWRITER SERVICE

TO CONNECT THEIR CLEVELAND AND DETROIT PLANTS



Thompson Products, Inc., produces a wide range of aircraft valves. To maintain a high standard of production efficiency, Teletypewriter Service* is used extensively for communication between their Cleveland and Detroit plants.

Typewritten messages covering every phase of the business are transmitted instantly, accurately and in precise—administrative instructions, sales, accounting, traffic, specifications, messages to jobbers, engineering details, production, delivery dates, changes in orders.

Typists in both offices operate the machines and find them as easy to operate as any typewriter. As soon as an official dictates a message, his stenographer types it to the distant plant, receives any necessary reply, and brings it immediately to the official. Then he has his answer.



in typewritten form within the space of minutes.

"Teletypewriter Service affords perfect coordination between all units," an officer says. "It improves efficiency and helps build customer confidence."

This modern business aid is equally effective, whether it connects airports stretching across the country, factories in different cities, or separated departments in the same building. Your local Bell Telephone Company will gladly show you how it might be of value to your firm.

* * *

*Teletypewriters are installed in the separated offices of growing business concerns by the Bell Telephone Company. They are directly connected in such a way that a message typed on one is reproduced at the same moment in identical typewritten form by any or all machines on the circuit. The service may be had for any number of hours each day, from one upward.

Before You
buy...fly a
KIMMER
POWERED SHIP

THREE SIZES • ALL 3 CYLINDERS • 100 H.P. • 125 H.P. • 210 H.P.



55 Airplanes powered with Kimmer Motors carry Approved Type Certificates. Among these are: Pioneer Aerobacs, 8' wing, Flat, Confiner, Wright, Breda, Sauer, Harkness, Arrow, Stam, Air Transport, Latham, Kipp-Hutchins, etc.

FAMOUS FLIGHTS WITH THOMPSON VALVES

The advantage is one of a more reliable service, superior flights in which Thompson Valves were used.



Circling the Globe in 8½ days

with the "WINNIE MAE"

They checked the valves at Fairbanks—and found they hadn't have bothered! That was near the end of the 15,000-mile trail that was blazed around the world by the Wasp-powered Lockheed Vega "Winnie Mae" between June 23rd and July 1st. For seven days those Thompson valves had helped to keep its motor roaring across the Atlantic . . . Europe . . . Russia . . . Siberia . . . the treacherous Bering Straits. Just 36 hours later it was back at its starting point, Roosevelt Field, with the same valves still functioning perfectly. Never a misfire from that motor throughout the entire astounding trip. Not the slightest loss of valve efficiency. Add this latest achievement to the long list of record-breaking flights which Thompson Valves have helped to complete, and you will understand why leading manufacturers and pilots insist on Thompson dependability for every aircraft engine need.

THOMPSON PRODUCTS, INCORPORATED

General Office: Cleveland, Ohio, U. S. A.
Factories: CLEVELAND and DETROIT

Thompson Valves



KENDALL HAS THIS HABIT

4000 MILES DAILY FOR PITTSBURGH AIRWAYS WITH
AN UNBROKEN RECORD OF LUBRICATION EFFICIENCY



The route of the Pittsburgh Airways Lockheed Vega and your engine gives Kendall lubricant.

Theodore Toney, Vice-President of Chicago of Spectrum.

MODERN transport companies have found by actual records over long periods that Kendall Oil keeps motors on the job, planes in the air and schedules on the clock. That is the kind of service

that tells its story on the profit side of the ledger of the transport line.

Mr. Theodore Toney, Vice-President of Pittsburgh Airways, Inc., gives an example of Kendall performance that will make profitable reading for airline operators everywhere:

"This Company has been operating between Pittsburgh and New York for the past two years, and during that time we have never had any sort of motor trouble directly traceable to lubrication.

We have never used one oil but 'Kendall' and have found it most efficient and exclusive under varying weather conditions. During the Summer our temperature runs from 70 to 95 degrees and in the Winter as low as 20 degrees below Zero. Year in and year out with no trouble of the least or kind.

Our daily mileage at the present time is slightly over 4000 miles, but we have the same confidence in Kendall Oil, and feel that it will go far towards making Speed with Safety a reality."

The Bradford Grade of Pennsylvania crude oil, from which Kendall is refined exclusively, commands a premium price—for good reason. Kendall Oil will give a full thirty hours of flying service without the necessity of change—by merely maintaining the oil level.

For complete details on Kendall Oil and a list of airports where it is sold, address, Kendall Refining Company, Bradford, Pennsylvania.



KENDALL OIL

REFINED FROM 100%
BRADFORD GRADE OF
PENNSYLVANIA CRUDE

Use the Air Mail!

BONDED and SHIELDED for RADIO! *Curtiss-Wright* SEDAN



*"That's fine,
all clear ahead"*

Dark clouds—thick weather all around—it's a grand and glorious feeling when you have a radio and don't have to guess what's ahead! The new Curtiss-Wright SEDAN is carefully bonded and shielded for clear radio reception and strong transmission—a safety factor which you have a right to expect in your modern cabin plane. It is typical of the many safety factors which Curtiss-Wright designers and engineers have incorporated in the SEDAN. There is safety, too, in the clear vision in all directions resulting from the shatter-proof glass windshield carried into the leading edge of the wings in the lowering position of the engine, and in the absence of outerwing struts. As smoothly new wing curves assure clear, safe landing. The famous Travel Air Hydro-Flux leading gear minimizes the danger of rough fields. Internal expanding brakes effect easy and positive ground control. A welded fuselage of the finest steel, and controls actuated thru ball bearings, add immeasurably to your feeling of security. Thoroughly advanced in its safety factors, this new 4-place cabin plane is equally superior in its class, smart looks, in its luxurious comfort and convenience, in its economy and in its nearly two-mile-per-minute performance when powered with any of three famous air-cooled engines. Compare its price by plane with any plane of its type or price and you will understand why this striking SEDAN is making new friends every day.

CURTISS-WRIGHT AIRPLANE COMPANY
ROBERTSON MISSOURI

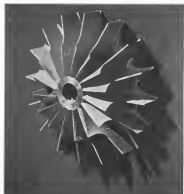


PRICES.

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130 H.P. Redhead Power \$5900
See Local Model

EVERY PRATT & WHITNEY ENGINE HAS A G-E SUPERCHARGER



THE remarkable dependability of Pratt & Whitney engines has been demonstrated time and again—in regular transport service, in military maneuvers, and in record-breaking flights. This performance pays high tribute also to General Electric superchargers—used in all Wasp and Hornet engines to obtain greater horsepower per pound of weight and better vaporization and distribution of the fuel mixture. The success of this General Electric product has resulted in an increasing demand for more supercharging.

THE General Electric supercharger consists of an impeller, or wheel, located in a specially designed passage between the carburetor and the intake manifold. It is usually driven by gearing to the crankshaft of the engine. In contributing to the performance of dependable engines, the G-E supercharger is having an important part in the progress of aeronautics. Your interest in General Electric products is invited. General Electric Company, Schenectady, N. Y.



The General Electric engine-temperature indicator is especially desirable for use with supercharged engines.

GENERAL  ELECTRIC
AERONAUTIC EQUIPMENT



What!

*increase our
appropriation in August?*

It's an old custom with many manufacturers to curtail advertising when summer comes round. What they say in effect is, "We hereby notify everybody that we do not expect to do business during the vacation period."

But we believe advertising is a 12 months' operation for every company that keeps salesmen on the job the year round. We believe the company that can afford to let up in the summer can afford to let up in October and January.

We believe, too, that the business man, the merchant, the engineer is going to read his business paper more than ever this summer. The reason must be obvious to anyone who knows what business is doing now to make short cuts to profits.

Because we really believe these things, McGraw-Hill increased its advertising appropriation to launch a supplementary campaign in business publications just as summer began.

In other words, we are notifying business men who use advertising and business men who ought to use it that we are not only open for business in the summer but that we are going out after it. These advertisements tell what business paper advertising can do for you right now. They point the way for you to invest your money in business publications for effective results.

Salesmen never needed hard-hitting advertising more than they do now. Give them help. Increase your advertising at once. Your advertising manager or agent knows how. Get him at work. Orders won't wait.

AVIATION
A MCGRAW-HILL PUBLICATION
Tenth Avenue at 36th Street, New York, N. Y.
MEMBER A.E.C.

LET YOUR PASSENGERS



**MAKE EVERY
PLANE
A
POSTAL
TELEGRAPH
OFFICE**



Postal Telegraph is twenty thousand telegraph wires and cables and radio service of international communication with a daily message. Through the great International System of which Postal Telegraph is a part it reaches Europe, Asia, Africa, Australia, South America, the West Indies and all the world's cities and ships and coasting boats.

KEEP IN TOUCH WITH THE WORLD

...BY POSTAL TELEGRAPH

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Your passengers will like this service. It's a thoughtful service. It's a progressive move for you to make. It's something passengers will remember favorably—and tell their friends about, when they next drop by.

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Ball  Bearings



B. G. TOOK THE WINNIE

NEW YORK, N. Y.
July 14th, 1931

Mr. August Goldsmith, President,
The B. G. Corporation,
136 West 52nd Street,
New York, N.Y.

Dear Mr. Goldsmith:-

We wish to take this opportunity to advise you that we were very pleased with the performance of the B. G. Spark Plugs which we used in our Lockheed plane, the Winnie Mae, on the round-the-world flight.

They functioned perfectly, and we were very glad that we had them on the engine.

Sincerely,

*Wiley Post
Harold Gatty*

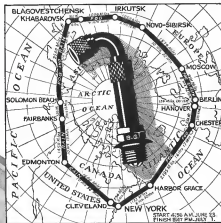
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Goldsmo, New York

THE B. G.
136 WEST 52nd STREET,

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- When you fill up your gas tank, you're really buying power with safety—uniform power which will wing you through space without a squitter from your motor. Unfortunately, as every aviator knows, impurities find their way into fuel.
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CONTINENTAL AIRCRAFT ENGINE COMPANY
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Wiley Post and Harold Gatty with their round-the-world, Wasp-powered Lockheed. The map shows their route, which took them over two oceans, across seven continents and through temperatures ranging from arctic to arctic. The total flying time for the distance of 15,474 miles was 4 days, 16 hours, 7 minutes.



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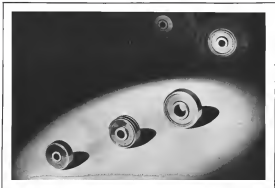
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Reproduced above is an aerial view of the modern plant of the Sikorsky Aviation Corporation, at Bridgeport, Connecticut

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In 1910 Igor Sikorsky had the entire satisfaction of test-flying his first plane, the S-1. During the 22 years which followed that successful initiation Sikorsky designs have shown a fine combination of genius with advanced aeronautical engineering. The application of this combination to the most modern of manufacturing methods has resulted in the use of the name "Sikorsky" as a synonym for the highest type of amphibious airplane.

Some 100,000 sq. ft. of floor space are included in the Sikorsky plant, which is as modern in construction, arrangement and equipment as the Amphibious it produces. Included in this great establishment is a com-

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plete Experimental Laboratory for research work and the proving of various details of aircraft design and construction. An essential feature of this aeronautical laboratory is the Vertical Wind Tunnel—the first of its type in the United States.

Sikorsky Amphibious—every one a worthy bearer of the famous "Winged-S"—are available in four models: the S-30, carrying five persons; the 10-place S-31; the S-41, which accommodates 16; and the S-42 for 40 passengers. For detailed information on any or all of these models, address Sikorsky Aviation Corporation, Bridgeport, Connecticut. Division of United Aircraft & Transport Corporation.

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FOR WINGS
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FOR WINGS
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... Aircraft registration records show only ONE make with number of active licenses totaling into four figures... and that one make is Waco. • The evidence is conclusive, also, that there is one make of aircraft supported by adequate nationwide service facilities... and that one make again is Waco. • Whether this Service organization is a cause or an effect of Waco Popularity is a moot question. Whatever the answer, the significant fact is that Waco Service is always within a short hop of any Waco... anywhere... at any time. Which is important! Don't overlook it is making your selection. For it makes your Waco a means of care-free travel... makes its ownership a matter of enduring satisfaction.

The complete WACO line ranges from \$4450 to \$9325, with Raytheon or other standard equipment on all models.

Substantive payments can be arranged! And remember the new WACO includes any credit facilities. See your distributor for details.

THE WACO AIRCRAFT COMPANY, INC., OHIO



There are other WACO's in private service than any other domestic make.



Even Fine Performance Becomes Better With CHAMPION SPARK PLUGS

Every pilot derives genuine enjoyment and satisfaction from an engine that is tuned to give an instantaneous surge of power, flashing acceleration and flowing smoothness at high or low r.p.m.'s.

Champion Aero-spark plugs incorporate all the time proven advantages of all Champions which so definitely improve engine performance, and in addition are specifically designed for aircraft engines.

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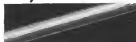
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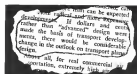
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